Project Planning and Analysis: Methods for Assessment of Rural Energy Projects in Developing Countries

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- Methods for assessment of rural energy projects in developing countries

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PROJECT PLANNING AND ANALYSIS

- Methods for assessment of rural energy projects in development countries

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Abstract: The report presents the results of both a theoretical and an empirical study of the role of project analysis in the national planning efforts of developing countries.
The most commonly used methods for especially the economic analysis - the socalled "cost-benefit methods" - are described in detail and the historical development of these methods is related to the dominant development theories. The theoretical and ideological basis, the methodological principles and the practical use of the methods are critically discussed.
The empirical study is based on a close collaboration with the Department of Energy (DOE) in Zambia, and focus has been on the activities aiming at energy and development in rural and suburban areas.
Based on an evaluation of the specific planning situation in the DOE a new approach to project analysis aiming at the activities related to energy and rural development has been developed. The approach has been implemented on a personal computer and a user oriented presentation of the simple and modular model (PRAM) is included.
The new approach reflects the criticism of the existing methods and emphasizes the importance of a combination of qualitative and quantitative considerations in the analysis and the use of a broad set of criteria.

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PREFACE

This volume is the final thesis presenting the results of the Ph.D. study - Methods for Assessment of Rural Energy Projects in Developing Countries - that has been performed at the Systems Analysis Department, Risø National Laboratory, in collaboration with the Institute for Mathematical Statistics and Operations Research (IMSOR) at the Technical University of Denmark and the Department of Energy (DOE) in Zambia.

Ass. Professor, Lic.Tech. Victor Vidal at IMSOR has been supervising the study assisted by M.Sc. Jørgen Fenhann from Risø.

During the study two other reports have been published, the first report [21] gave a short macro-level introduction to the Zambian society but focused mainly on a presentation of the detailed micro-level results of an energy survey jointly performed with the DOE. The second report [22] gave a description and an analysis of the national energy situation in Zambia, the structures of both the government administration and the parastatals and their roles and activities in relation to energy supply and consumption. Special emphasis was put on how energy projects are initiated, analysed and selected.

Together these two reports present the empirical basis for this thesis, where the first part is devoted to a discussion and analysis of the general tendency towards increased importance of project planning and the most common planning approaches and analysis methods. The last part is a presentation of an alternative approach to project preparation and analysis directly aiming at the specific situation in the DOE in Zambia. This approach is based both on the empirical background and on the general analysis of the existing planning traditions.

The subjects discussed in both the earlier reports and this thesis are quite complex and there are numerous ways of addressing them. I therefore hope that the three volumes together give a fair presentation of the many problems related to both rural energy development and project planning and analysis.

I would like to thank especially Victor Vidal and Jørgen Fenhann for their valuable support and advice and also their patience in the long process of synthesis.

A number of other persons both in Denmark and Zambia have been very helpful in the different phases of the study. It is not possible to mention all by name but Gordon Mackenzie, Hans Ravn and Vita Pedersen have had direct influence on the result through comments and critique of the various draft versions of the reports.

Everyone in the DOE have been very helpful and especially Silvester Hibajene and Gordon Mackenzie have been important as basis for the close collaboration. Renato Ezban, Kjeld Oksbjerg and Peter Søndergård all gave valuable support and input at different stages of the collaboration.

A very special contribution was provided by Gordon and Lillian who took care of all the practical arrangements in Zambia and let me stay in their home during my visits.

Finally Maria M. Andreasen performed all the typing of illegible notes and patiently lived through the process of drafts and corrections.

The Danish Council for Scientific and Industrial Research kindly supported the trips to Zambia together with Risø.

1. INTRODUCTION

1.1. Background for the study

The decade from the mid-seventies to the mid-eighties has placed the energy sector in focus in most countries around the world. The consequences of the increasing oil prices have been experienced in both developed and developing countries, and rising import costs have put additional severe strains on the economies of many already indebted countries. These problems are well known and many actions have been taken to meet them.

The same period did, however, also reveal another basic energy related problem in many developing countries, where the traditional fuel source for people in rural areas as well as the majority of the predominantly poor population the rapidly growing urban centers is wood, used either directly as firewood or as charcoal. As a result of many interacting factors like population growth, extension of farming areas, industrial wood use, growing woodfuel consumption, etc. the basic wood resource is being depleted more rapidly than the rate of natural reproduction. This depletion results in a gradual deforestation with both major ecological impacts and increasing supply problems for the woodfuel users.

The actual situation varies from country to country and region to region, but the basic tendency is the same in a large number of developing countries. The extent and consequences of the situation is only gradually being recognized.

As a result of both commercial and "non-commercial" energy crisis, an increasing number of energy projects are being carried out in developing countries either on a commercial basis or with funding from the government, external donors and development organisations.

The increase in the number of ideas and proposals that have to be prepared and analysed, both in the government administrations in the developing countries and in the donor organisations, has inevitably caused problems with regard to managing both the number and desired quality of the analysis. There are many causes for these problems like insufficient administrative resources, lack of qualified personnel, insufficient and inadequate knowledge and analysis methods. The latter is particularly true in the case of woodfuel and rural energy projects.

This relative increase in the importance of the energy sector is naturally the direct cause of the growing number of activities. As described further in chapter 2, there is, however, also a general tendency in many developing countries towards increasing importance of the planning activities at the project level at the expense of macro-level national planning.
This process of change in planning focus is placing project analysis and selection methods in a central role, and although much of the research and development in this field aims at generally applicable methods, there is a growing understanding of the need for and the importance of designing and adapting the methods to the specific political and administrative context, where the actual user is situated.

The aim of this study has therefore been to establish new or alternative methods and tools for project analysis to be used in connection with the problems of rural energy development planning.

The results of the study are to a very great extent based on empirical evidence from Zambia, not least because of the close collaboration which has existed with the Department of Energy (DOE) in Lusaka almost since the outset of this work. This collaboration has been extremly important for the way the work has developed and the form of the obtained results and conclusions.

1.2. Structure of the study

In order to pursue the described general aim, the study has been structured around five major activities:

- a study of the situation in rural areas in Zambia with focus on energy aspects. The study is based on both the general available literature and practical in-the-field experiences,
- an analysis of the general political, economic and social structures in Zambia and their historical background in order to establish a general understanding of the conditions for national and sector level planning,
- an in depth study of the planning activities and project procedures within the energy sector institutions with background in the general structure analysis,
- an investigation and evaluation of the project planning approaches presently being used both in developing countries based on the Zambian case and in some of the national aid-agencies and international development institutions,
- based on the experience from the previous activities to develop new methods or tools for project analysis in an energy planning institution in a developing country, directly aiming at the Department of Energy in Zambia.

In principle the activities should be performed in the listed order, but since they naturally are not independent of each other, much of the work has been performed parallel, but with changing focus.

Due to the complexity of the tasks and the dynamic character of the studied aspects, it is not possible to say that one of the activities has been fully completed. Indeed the more these aspects are studied and analysed the more new aspects seem to remain to be looked at. The results therefore express necessary priorities imposed by the economical and institutional frames of the study.

1.3. Presentation of results

Due to the wide and multi-dimensional character of the study, it has been found appropriate to publish the results in separate and fairly independent volumes. This form was also favoured by the partner DOE especially because the first report "Energy Survey in Zambezi" [21], where the results of the field survey in a rural area were presented, could be used directly as documentation and presentation material in the work of the Department.

The second report "Energy Planning and Project Procedures in Zambia" [22] presented the results of the second and third of the above described main activities, while this thesis covers the last two tasks including also the relevant conclusions of the first two reports.

After this introduction to the overall background, aim and structure of the study, chapter 2 is a general analysis of the causes for growing importance of project planning as a tool in public development-planning activities.

In chapter 3 the present, commonly accepted approach to project planning is analysed, and the connections to development approach and strategies in the dominant development institutions are described.

Some of the most widely used methods for economic viability analysis are described and critically discussed in chapter 4. The impact of these methods on other parts of the planning process is also discussed.

Chapter 5 presents a brief introduction to the concept of rural development and an analysis of how the presented perception of the concept influences the way projects should be identified, prepared and selected.

On the basis of the empirical knowledge about Zambian public planning and especially the Department of Energy, an assessment

of the needs for improved analysis methods is performed in chapter 6, and the practical restrictions and possibilities are analysed.

In chapter 7 the developed PRoject Analysis Model (PRAM) is described and presented in a user oriented way with emphasis on the structure and functions of the model.

Finally in chapter 8 the results of the study are critically evaluated, and the implementation possibilities for the PRAM are discussed along with the general problems related to transfer and development of planning technologies.

The presentation in especially the planning and analysis sections does require that the reader has a basic knowledge about the subjects. Those mainly interested in the suggested planning approach can therefore exclude these sections, although they are highly recommended in order to fully understand the background of the approach.

2. THE ROLE OF PROJECTS IN PUBLIC DEVELOPMENT PLANNING

2.1. Introduction

Projects have always been an important tool in the realisation of public development planning. This importance has, however, increased significantly in the last 10-15 years where micro-level project planning has gradually gained importance at the expense of earlier and more ambitious ideas about comprehensive long term macroplanning as the basis for development policy (see ref. [27], [61] and [62]).
This is naturally a change that is happening gradually, and obviously the situation varies from one developing country to another due to the specific historical, political and social

conditions. However, since many of the causes for the growing emphasis on project planning are valid for almost all countries, this may be expected to be a general tendency. These causes will be discussed later in this chapter on the basis of the Zambian case.

The virtual collapse of the Zambian economy in the last few years means to some extent that the present analysis shows an extreme example of the shift from macro- to micro-level planning. However, the tendency was visible even before the economic problems made the traditional five year planning procedures illusory.

It is not the intention in this chapter to discuss how comprehensive development planning should be organized and performed. A vast amount of literature exists on this topic, but still the practical evidence from all over the world shows that it is very difficult to translate the theoretical ideas into practice. Instead the focus here is on some of the factors that restrict the possibilities for establishing comprehensive planning procedures in many developing countries.

2.2. National development planning

Speaking in general terms about developing countries it is characteristic that public planning and control is regarded as an extremely important activity in the development efforts [61]. This is not necessarily due to the fact that the public sector often represents the dominant part of the Gross National Product, although this is the case of Zambia because of the large parastatal engagement. Public investments will, however, usually represent the vast majority of the total investments, and these activities are of strategic importance for the private corporations for instance through infrastructure development. The fact that foreign aid and loans are often an important source for public investments emphasizes the need for public planning and control in order to be able to present coherent proposals to the foreign donors and banks.

Another very important aspect of public development planning is that, in a situation where economic resources are limited, it functions as a political tool for reaching an acceptable compromise between the influential social classes or groups on what the development aims are and how they can be reached.

The public planning efforts can be divided into three general phases or levels [62]

- integrated macro-level planning
- inter-sectoral planning
- micro-level project planning.

Earlier the planning approach in many developing countries was predominantly based on a "top-down" approach, where the idea was to define the political goals and how to try to achieve them with the available resources through a comprehensive macro-level effort. In most countries this is done on a five-year term based on the economic situation at the start of the planning period, an evaluation of the results of the previous period, and forecasts of expected international and domestic development within the planning period. Financial resources expected from both revenue, grants and loans are estimated and inter-sectoral priorities are established in relation to the overall aims. Larger programs and projects are often specified within the general sector plans.
Within the frames of the sector plan and budget the responsible institutions will have to try to meet the intentions through a number of project activities. In principle it ought to be formulated as an aggregate program of investments, but usually this is impossible and the projects are planned and analyzed individually within the overall framework.
The interconnections between the phases may vary and the administrative setting will reflect the specific social, cultural and political conditions in the individual countries, but the attempts to use the top-down approach based on macro-level and inter-sectoral planning has generally been the same in a number of developing countries.

In Zambia this approach can be illustrated by especially considering the First and Second National Development Plans, which were clear attempts to accomplish public planning through a top-down approach [37].

There are, however, very few examples of practical successes for the macro-level based top-down planning approach, and some of the underlying reasons for the failures of this approach are listed in Figure 2.1 and discussed briefly below.

Reasons for failures of macro-level/top-down planning	
Internal	External
Administrative limitations	Dependence on International economic development
Lack of political will	International political restrictions
Structural difficulties	Development cooperation
Scarcity of funds	

Fig. 2.1. Reason for failures of macro-level planning

Administrative limitations naturally impose general restrictions on planning efforts at all levels. In many developing countries government institutions have a permanent shortage of educated staff. Especially people with a university degree as economist, engineer, planner, etc. are scarce and can usually find better paid jobs in the private sector.
In order to pursue the centrally controlled top-down approach, it has been the practice to focus on the establishing of a strong central planning unit often with foreign assistance and tight political control. The aim of this unit's work has then been to formulate the macro-level plans typically on a five-year basis.

Because this central unit is not based on a firm sector or regional structure, problems arise both concerning reliable input data for the planning work and the possibilities for implementing the plan. Furthermore, monitoring and evaluation of the implementation during the planning period in order to make adjustments and revisions will usually only be very limited. The result of the efforts to try to follow a top-down approach will, therefore, often be a fairly optimistic five year plan stating the overall political aims and desires, but with a low level of detail on how these aims could be met. The major well known and defined activities will be included, but the phase of elaborating the plan from the general to the sector level will normally be weak or missing, which is crucial for the relation between the actual activities at sector level and the general plan.
In practice planning on the sector level only refers to the general aims in order to legitimate the activity, meaning that the process is not top-down but separate macro- and micro-level planning.

Lack of political will to follow up on the general aims of the macro plan is another major reason for the failure of top-down planning.

The official development strategy, which is usually the basis for the formulation of the general goals on the macro-level, is naturally a political compromise between the interests of, on the one hand influential groups such as high level government officials, industry and land owners, trade unions, etc. and on the other hand the necessary consideration for the importance of the large but marginalized groups of rural and urban poor. The macro plan may therefore include some generally formulated aims like rural development, decentralization, etc., because these aspects are important for development on a longer term. If in the short term, however, implementing these aims impinge on the interests of politically influential groups in the existing power structures or on the general distribution of wealth in the society, then these groups will naturally try to prevent

the implementation. In this situation the discussion is related to groupings at the national level, but it also has a bearing on urban and rural relations and on the structures of the local community.

The interests of the various groups may, however, both interact and counteract meaning that a policy direction can be followed in spite of opposition from a few of the mentioned influential groups. At the political level the divergences between the long term development interests and the short-term wish for political stability are often visible. An example is the fact that the scarce funds often devoted to urban activities at least in countries like Zambia, where the political reactions of the urban population are of greater importance than the fact that the actions may increase problems in the long term.

At the local level the individual politicians wish to secure funds for activities in their own constituency in order to help friends and family and to secure reelection.
These considerations about the interests of influential groups and politicians are naturally not special for developing countries, on the contrary they are well known in all societies. The impact is, however, often more obvious due to the administrative weakness, the magnitude of social differences, the scarcity of funds, etc.

Structural difficulties in performing macro-level planning in a society where the actual dominant sectors often are subsistence based or of an informal character. Planning tools like input-output methods, macro-econometric modelling, etc. have often been transferred from a totally different society and even with modifications, the basic premises still differ so much that the validity of the tools is very doubtful. Many of the policy tools that might be effective for regulation in a developed economy do not have the same relevance in a society dominated by informal and subsistence activities. The statistical data problems mentioned above emphasize the problems related to macro-level models.

The scarcity of funds and the need for linkage investments together often have the practical effect that actions with high priority have to be postponed in order to have sufficient funding for following up on earlier investments. Many linkages should probably have been discovered in the planning phase, but many aspects are discovered in the implementation phase or are neglected because they might prevent a prestige project from being undertaken.

All the aspects or reasons listed until now are basically of an internal character. External influence is naturally just as important to consider, and a few essential aspects are therefore discussed at a general level.

Dependence on international economic development is obviously important for public planning in almost all countries. But the effects of fluctuations on the world market are normally more severe in the vulnerable economy of a developing country. The usually low level of diversification means that most countries rely on only a small number of different products for export, and it is predominantly primary products. Zambia is an extreme example of this situation with more than 90% of the export based on one single product, copper. The fall in world market prices for copper especially in the mid-seventies has had severe consequences for the Zambian society and consequently also for the planning possibilities.

The seriousness of this export situation is underlined by the fact that most developing countries have to import both general manufactured products and food. The generally under-productive agricultural and industrial sectors are unable to meet local demand. In the case of oil-importing developing countries there has been a general decline in the terms of trade in the last couple of decades and in addition to that many developed countries have trade restrictions in order to protect their own industries.

External political restrictions are well known in the form of

trade restrictions, customs rules in favour of domestically produced products, etc. But in many situations the restrictions may be of a more extensive nature e.g. civil war in a neighbouring country resulting in closing of transport routes, need for preventive military expansion, refugee problems, etc. During the last decades this type of conflict has been frequent in many third world countries, and again Zambia is a somewhat extreme example especially in the late seventies, where civil war in Angola, Zimbabwe and Mozambique meant that the cheapest and best transport routes for foreign trade were cut off for a long period. There is still no opening in Angola and only slowly is Beira in Mozambique becoming a possibility again.

An additional factor affecting development in the whole region is the active policy of "destabilization" by the Republic of South Africa. The policy is performed through many different actions e.g. support to guerillas in Angola and Mozambique, attacks on alleged bases for the African National Congress in Botswana and Zambia, forcing these countries to maintain a high and expensive military preparedness, etc.

International development cooperation is a source of large and growing importance for the financing of development activities. The focus in this cooperation is generally on the project level either as individual activities or as part of a more comprehensive programme. Identification and presentation of projects have therefore gradually become more important and although accordance between development strategy, political aims and the individual projects is considered to be very important, it has in practice been very difficult to connect the top-down approach with the increasing focus on the micro-level. In practice the accordance between projects and the development aims is often considered to be a mere formality also because the level of detail in presentation of the aims is low and usually not very operational.

Major organisations like the World Bank, UNDP, etc. often conduct their own country or sector studies in order to identify

the key areas for international funding. These studies are, however, generally not connected to the national planning efforts and therefore indirectly express the lack of practical success of the top-down planning approach.

Several other aspects could also have been mentioned, but the ones discussed are considered to be some of the most important. It must, however, be emphasized that changes in planning approach are the result of a dynamic process, where there will be differences between the way these changes appear in the individual countries on the basis of their specific historical, political and social conditions.

2.3. Increasing focus on projects

Through the seventies the general lack of success of macro-level top-down planning led to increasing focus on micro-level project planning. This tendency was strengthened by the general economic recession and the increase in oil prices experienced in this period, because these international developments imposed severe problems on many national economies at least in oil-importing countries. With less possibility for domestic funding the importance and impact of international development grants and loans grew, and as already discussed this supported the trend towards the project focus.

The result is not necessarily a "project by project" approach but more of a bottom-up strategy, where sector specific projects are the basis for inter-sectoral priority planning and some macro-level coordination depending on goals and resources. The prepatory work for the Fourth National Development Plan (FNDP) in Zambia was an example of what could have been a coordinated bottom-up approach. The planning work was organized with basis in sectoral committees governed by a set of common guidelines and with central committees for macro-level coordination. The sector work was at least in the energy sector highly project oriented based on a set of projections for consumption and sup-

ply of the various energy sources. For the first time the five-year exercise was to be followed by annual plans in order to update and monitor the plans. Unfortunately the plan was never published because rapid economic changes made the basic assumptions and projections highly unrealistic. Some of the basic sector plans and priorities are, however, still relevant due to the bottom-up strategy, which is much less vulnerable to changes. The general tendency in many developing countries at least in Africa regarding planning structures seems to go in the direction of short-term/annual plans, perhaps within a generally formulated medium-term/five-year frame and based on a "policy-guided" bottom-up approach.

In the same period both the international development organisations and the donor agencies of the individual countries experienced a growing public and political concern about the efficiency of their aid and loan programmes. There were many motives for their concern e.g. the increasing nominal amounts for aid programmes, a growing number of reports about unsuccessful projects and programmes, general focus on government expenditures as a result of the economic recession, etc.
The criticism was centered around project planning and administration in the funding organisations and to some extent also on the lack of administrative capabilities in the recipient countries for implementing projects.
One of the major reactions to the criticism was to try to develop improved project handling procedures of relevance for both the donor organisations and the policy- and project administrations in the developing countries.
These developments will be described further in the next chapter where the traditional approach used in most international organisations and government administrations for planning development projects is presented.

3. PROJECT PLANNING

While the previous chapter presented some of the causes for the tendency towards increasing importance of micro-level project planning, the ambition in this chapter is to describe and analyze how project planning is organised and performed. This naturally varies depending on the specific economic, social and organisational settings, but the fundamental structures and theoretical basis seem to be the same in many countries both developing and developed.

3.1. Classical planning theory

The purpose here is not to give a presentation of planning theories in general, but merely to describe the theoretical and ideological background for this widely accepted approach for project planning.

There will be no attempt to make a definition of the concept of planning, because definitions tend to be either so general that they do not have any explanatory value, or so limited that they only reflect one or a few approaches to the concept. In accordance with Lyngvig and Vidal [44], it is therefore found that the concept should be defined in the specific context in which it is being analyzed.

The analysis here will therefore be limited to focusing on one approach to planning. It is the "classical" approach, which in the literature is generally referred to as rational planning. The interpretation of the term rational varies considerably and has been subject to a great deal of debate. The interpretation naturally has influence on the actual planning process, and especially the selection criteria. Because the term has been developed in relation to industrial decision making and later transferred to public planning, the original definition of

"rational" as a situation where benefits are maximized at minimum costs is generally used.
The actual description of the steps or phases in the rational planning process may vary slightly, but this rather elaborate description by Coneyers [23] covers the sequential steps quite well.

(1) A problem which requires action is identified and goals, values and objectives related to the problem are classified and organized.
(2) All important possible ways of solving the problem or achieving goals and objectives are listed these are alternative strategies, courses of action, or policies.
(3) The important consequences which would follow from each alternative strategy are predicted and the probability of these consequences occurring is estimated.
(4) The consequences of each strategy are then compared to the goals and objectives identified above.
(5) Finally, a policy or strategy is selected in which consequences most closely match goals and objectives, or the problem is most nearly solved, or most benefit is got from equal cost, or equal benefit at least cost.

Fig. 3.1. The rational planning approach

If the approach is to be followed in detail, it would require very comprehensive analysis work, and one of the problems is therefore, how to reduce the analysis and still claim that it is the rational decision that has been reached. The traditional solution to this problem is to focus the analysis on technical and economic aspects and to base the selection on economic rationality in narrow terms. This focus reflects an ideological choice, where goals and objectives are restricted, based on the preferences of the planners or decision makers.

It is also important to be aware of the ideology which the rational approach itself is based upon. It reflects decision making in a hierarchical organisation and is not suited to decentralized structures, participation, etc. Furthermore, when the approach is used in public planning the basic assumptions about common goals and common costs and benefits express a harmony perception, which is not in accordance with realities. This discussion will be resumed in the next chapter, where some of the commonly used analysis- and selection methods are presented and critically analyzed.

The rational planning approach has had a large impact on how development projects are prepared, analyzed and selected both in the international organisations, the national donor agencies and in the national and sector planning units in the developing countries.

3.2. The project cycle

The generally accepted approach for planning development projects, especially those where some type of foreign grant or loan is involved, has been developed by the World Bank as their internal procedures, but the concept and terminology is now widely used and affects project planning in developing countries even when no external funds are included.

The approach is called "the project cycle" [4], [61] and it was developed in the late sixties and early seventies partly as a result of the critique that arose in this period of the results which had been achieved.

In Fig. 3.2 a rather elaborate presentation of the separate phases in the project cycle is shown.

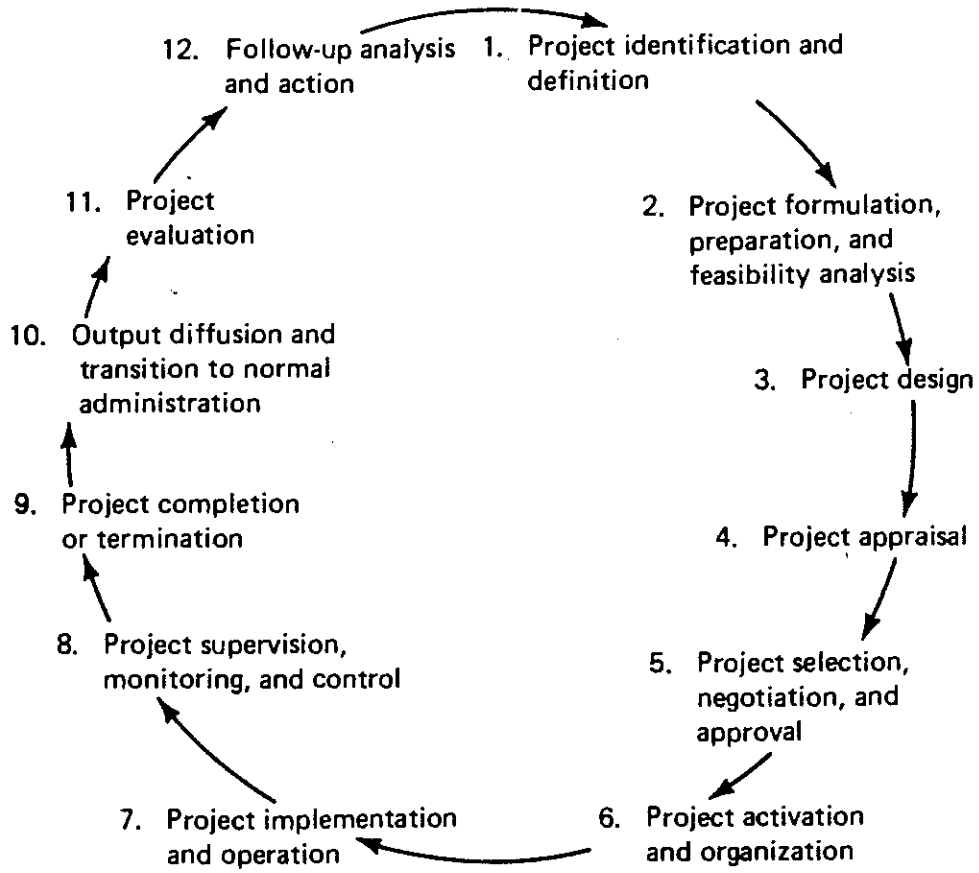

Fig. 3.2. The project cycle (Rondinelli, 1977)

It is evident that the content of the first five phases is very similar to that of the rational decision making process and the elaboration of the short headings in the following will show that the project cyle is directly based on the ideas of rational planning. The other phases of the cycle from six to twelve are equally important for the total planning process but with the described aims of this study, the presentation will be centered on the first five phases and assume that some kind of external donor funding is involved.

Project identification

In the ideal situation where the top-down planning approach was functioning, projects would be identified as a result of the planning process. In World Bank terminology the identification therefore means

> "Selection by Bank and borrower of suitable projects that support national and sectoral development strategies and are feasible according to Bank standards". (Baum, 1978)

In reality, however, identification does not function according to these principles. The general lack of success for the top-down approach was described in the previous chapter, and the result is that project ideas emerge from a mixture of formal and informal sources like politicians, researchers, private companies, foreign donor organisations and enterprises, etc. The large international organisations like the World Bank and major UN institutions often perform their own country or sector studies and in that way identify projects suitable for their own type of assistance. This is also indicated in the World Bank terminology, which said - selection by Bank and borrower.

A difference worth noticing between the first phases of the rational planning process and the project cycle is that the first talks about problem identification while the latter starts with project identification. This distinction is caused by the assumption that project ideas have emerged from the previous macro-planning exercises, but when the reality is different, the result might be that there are deviations between the actual problem and defined aims of a project. It is therefore very important to include the problem analysis in the preparation phase, but due to the different formal and informal sources of project ideas and their different level of elaboration of the ideas, the problem is often only implied.

The result of the identification phase is one or more projects in which the basic idea and practical frame has been selected for continued analysis. This selection may be performed at sector or national level with or without the involvement of a potential donor, but as described in the previous report of the study [22], it is common practice that donors are involved and partly committed already in the identification process.

Project preparation

Phases two and three in the cycle are usually performed under the general heading of preparation. The detailed activities covered by this heading may vary considerably according to the type and size of project, the administrative resources of the government institutions involved, previous experience within the field, etc.

It is in principle seen as the responsibility of the country itself to make a thorough preparation of the project, and the time spent in this phase can be quite considerable.

The work in the preparation phase should in principle include all the aspects mentioned in steps two, three and partly also four of the rational planning approach covering the range of technical, institutional, economic and financial conditions. Since this is not possible in practice, the task is usually reduced rapidly to looking at one or a few possible ways of achieving the project aims. This selection is done either on the basis of experience or according to the specific interest of one of the involved institutions.
The potential funding organisation often supports either financially or technically a more in-depth feasibility study, if the local institutions are not capable of performing it.

If more than one alternative way of performing the project is considered, a selection will have to be made during the preparation phase, because the more detailed design work is normally restricted to only one solution. The selection is easy if one of the alternatives is outstanding on all relevant parameters, but this situation is naturally rare. When the technical and institutional aspects are met at an acceptable level, the decision narrows down to the "rational choice", where maximizing the benefit/cost ratio is the solution, and as it will be discussed later, the final criterion is usually reduced to economic viability expressed in benefit/cost terms.

The outcome of the preparation phase will generally be pro-

posals, where the level of detail may vary according to both what has been agreed between the involved parties and the planned comprehensivenes of the appraisal.

Project appraisal

The appraisal phase is regarded as the final and most thorough review of the project proposal.

> "It is a critical stage of the project cycle because it is the culmination of the preparatory work, provides a comprehensive review of all aspects of the project, and lays the foundation for implementing the project and evaluating it when completed". (W.C. Baum, 1978)

In donor funded projects the appraisal is performed solely by the involved donor organisation, perhaps through external consultants, and the work usually follows a set of guidelines specific for the organisation. There is, however, basically coherence between the major aspects considered in the different organisations.

In the original context as it was developed by the World Bank, the appraisal focused on four major aspects of the project - the technical, financial, economic and institutional viability. In recent years other aspects like political, social and environmental viability have been included.

Although the appraisal is formally performed before the final selection of the project for execution, it is rare to see rejections of projects at this stage. Both the donor and the administration in the recipient country are usually committed to the project and often a formal approval has been signed. This does not mean that changes and modifications cannot be quite comprehensive, but it indicates that the problems to be addressed and the basic structure of the project are selected at an earlier stage in the cycle.

The direct impact of the appraisal is therefore mainly on the detailed design of the project, which naturally is extremely important for the outcome, but another and perhaps more indirect but not less important impact is the influence that the methods

and criteria used in this phase have on the standards for how the analysis and preparation of the proposals in the earlier phases are performed.

Project selection, negotiation and approval

The result of the appraisal is the final report about the project and together with any supplementary material from the preparation and design stage it forms the basis for the negotiations between the government representations and the funding organisation. The resulting agreements form the basis both legally and practically for the execution and implementation of the project.

If the other phases of the cycle have been performed in cooperation between the sector planning unit and the interested donor, then an agreement is usually reached without many complications. Selection between possible projects and alternatives has been performed at the early stages, so a rejection by one of the parties will have to be based on some rapid changes since the studies were carried out or principal disagreement on some of the funding conditions. However, as already stated, this very rarely occurs.

If this theoretical presentation is compared with the realities, as they are experienced by the Zambian government institutions [22], there seems to be general acceptance of the aims and structures of the individual phases and the role of the funding organisations. There is, however, a strong tendency towards limiting the identification and preparation work rapidly down to one basic proposal, especially if a possible donor has expressed previous interests in this type of activity. This tendency is mainly a result of the limited administrative resources, because there will naturally be more interest in spending the scarce time on projects, where funding is partly secured than on equally good proposals, where the possibilities for implementation are not so good.

This early commitment to one proposal naturally affects the planning process, but this one proposal will usually still follow the phases in the project cycle focusing the analysis on

design parameters and alternatives. This practice is therefore merely an extreme example of the general necessity to reduce the analysis task.

This short elaboration of the project planning phases in the project cycle only covers a limited number of the involved aspects, but it underlines the fact that the structure of the approach is based on the theories of rational planning. The specific phases, their connection and the division of activities between the recipient government and the donor organisations reflect the existing ways of cooperation in this special context, but the underlying principles are those formulated on rational planning.

3.3. The economic viability criterion

One of the considerable deviations, between the theoretical concept and the way planning of development projects is handled in practice, is the fact that selections are made in all phases of the project cycle. One of the reasons for this deviation is the previously described fact that it is not possible to perform the ideal comprehensive analysis in practice, and the planning task has to be reduced to a manageable size.

Some of the selections are not based on any analysis, but are results of deliberate choices founded on political views, experience, prejudice, etc. or simply the result of unconscious neglect of possible alternatives.
If, however, the decision is based on an analysis of the project or proposal, the costs and benefits considered will usually always be measured on an economic scale, and the final decision criterion will be the economic result expressed in comparable terms. This is naturally only relevant if the proposals are not directly unacceptable from a technical or organisational point of view.

As will be discussed in more detail in the next chapter, the interpretation of economic viability has changed over time and

the importance attached to it varies from organisation to organisation depending on ideological views, development strategy, funding constraints, etc. However, there is no doubt that the economic viability criterion is still generally regarded as the single most important factor for the selection decisions in all the phases from identification to appraisal.

> "The economic analysis always aims at assessing the contribution of the project to the development objectives of the country; this remains the basic criterion for project selection and appraisal".
> (W.C. Baum, 1978)

This general statement is strongly supported by the empirical experiences from Zambia, where economic viability is used as conditional criterion.

This focus on the economic aspects is closely related to the traditional interpretation of rational choice, where the comparison of benefits and costs are defined as the economic understanding of the terms.

Another very important reason for the emphasis on the economic criterion in relation to the analysis of development projects is the fact that the development strategies in both the developing countries and most international development organisations until at least the early-seventies were dominated by the so-called "growth-theories". These theories are very briefly described founded in the assumption that general development is closely linked to economic growth of the society and that the effects of the growth will gradually "trickle-down" and spread to all parts of society. The use of a criterion that aims at maximizing the economic benefit/cost ratio is therefore a logical consequence when economic growth is the main objective. A discussion of the changes in development theories and strategies from the early seventies and how these changes have affected the use of the economic viability criteria in decision making will be outlined in the next chapter.

Until now the described background for using the economic analysis as a basis for selections has been on the theoretical and ideological level. There are, however, also some more practical causes. If general agreement can be reached about a common set of criteria, the tasks of collaboration and comparison of results between the involved persons and organisations become easier.
The planners and decision makers can also justify their choices more easily if the criteria and analysis methods are generally accepted.
Furthermore, the methods used in the economic analysis have by their focus on general costs and gains for the society been widely presented as providing a neutral and maybe even objective criterion for society's preferences.

In the next chapter the most commonly used methods for economic analysis will therefore be presented and critically discussed with emphasis on their validity as decision making tool in relation to development and in this context also their alleged objectivity and political neutrality.

4. ANALYSIS AND SELECTION METHODS

4.1. Introduction

All the discussed phases of the project cycle together present the complete selection process, where the overall principal ambition is to find the activities that on the basis of the available resources and the recognized constraints make the best contribution to the established aims of the society. There is in principle no difference whether the analysis is performed by the involved national administrative units or the external funding organisation. In practice this ideal situation is, however, not prevalent and the decisions are naturally influenced

by the interests and aims of the involved organisations, groups and persons.

In spite of this and in order to understand the background of the arguments the following brief presentation of the general theoretical background for decisions on the preferences of the society assumes that the ideal situation exists. If the established aims of the society were described in detail and the economic resources abundant, there would evidently be no problem with regard to preferences. However, neither is the case. As already described in chapter two, the aims of the society are only established at a very general level and are usually not very operational. Economic resources, at least within the national budgets of the developing countries, are generally scarce, and the international development organisations and banks and the national donor agencies also generally consider economic resources to be scarce (although many employees of such organisations privately regard "good" projects as the scarce resource!). The general question is therefore how to determine what society prefers and to establish some analysis methods and criteria that enable the society to select among the possible actions/projects those that best meet the preferences.
Without entering into a discussion of the role of the state (see ref. [44]), the generally dominant view in societies based on a capitalist mode of production and through their historical, political and economic influence also in the large majority of developing countries (rather independent of the official ideology) is that of the utilitarian state, where the overall objective of the state is to maximize the total welfare/development of the society.

This view of the state is embedded in what is usually called the neo-classical economic theory of welfarism. Within the context of this theory an immense amount of work has been devoted to establishing a general social welfare function and analysis methods for deriving operational results.

The main methodological assumption behind this type of work is

that it is possible to develop methods based only in theories disregarding the actual applications. The opposite view which will be pursued in the method development in this study is that method and practice cannot be separated.

The so-called Cost-Benefit Analysis (CBA) method is one of the most widespread responses to this search for analysis methods. The principles of CBA will be presented in the next section, while some of the underlying theoretical conditions and assumptions upon which the method is based will be introduced here.

The CBA method is based on the general theory of welfare economics, but only the assumptions and definitions of special relevance in relation to the method are presented in the following:

- the preferences of the society can be established as the sum of individuals' preferences

- the preferences of the individuals can be measured in quantifiable economic terms by their "willingness-to-pay"

- individual preferences may be regarded as independent entities

- the costs or benefits of an activity are not affected by the form in which it is provided, allowing these costs and benefits to be compared in a monetary form

- both the individuals and the society act according to the previously described principles of rationality.

These assumptions are all based on and express the fundamental ideology of welfare economics, in which the society is considered to be in basic harmony meaning that all the people in principle have common interest disregarding any class or group-based contradictions. This common interest assumption also implies that society would launch a project or an activity, if an

analysis indicates that the total gains exceed the total losses, because then the "gainers" could theoretically compensate the "losers", and society as a whole would be better off.
The principle behind this argument is fundamental for the concept of CBA and theoretically described as a "potential Pareto improvement" [3], [47]. (Pareto optimallity is defined as a situation, where nobody can be better off without somebody else being made worse off and this criterion is the theoretical base for the general welfare function in neo-classical economics). The fact that the principle is setting up a criterion based on a potential improvement is important, because the described compensation between "gainers" and "losers" is only assumed, and in the analysis there is no consideration of the actual possibility of compensation or how it should be done. With the harmony view of society it is not necessary to consider the distribution of costs and benefits, since there are no conflicting interests and if some compensation is necessary in order to reach a "Pareto optimal" situation, the state will, through its various intervention functions, act as the regulator and be responsible for any necessary redistribution.
The harmony view, the assumptions and hypothesis that the theories of welfare economics are built upon, have naturally been subject to severe criticism of which some of the main points will be raised in section 4.7 as part of the general discussion of the validity of the CBA approach.
Historically the importance of the theoretical approach has varied significantly over time, but the underlying ideology of rationality, growth, market forces, free trade, etc. has been and still is an important part of mainstream thinking in the countries based on a capitalist system.
It is evident from the short presentation of some of the basic aspects of welfare economics that the main aim of a society is considered to be economic growth. On the policy level this may be supplemented or substituted by other more specific goals, but when measurement of preferences in economic terms and the "potential Pareto improvement" criterion are accepted as basis for the analysis, then the economic growth aim is accepted through its inclusion in the theoretical understanding.

This view of the overall aims of the society is therefore necessary in order for CBA to be a consistent analysis tool. To evaluate the relevance of CBA methods within the context of development, it is necessary first to look at development strategies and theories. At this general level of discussion only the dominant tendencies will be outlined, since the intention is merely to give a general background for the understanding of the role that CBA methods have achieved in the analysis of development projects.

Development theory as a distinct discipline emerged in the late forties and very broadly characterized, it was at least until the late sixties dominated by the basic ideology of welfare economics, though often with an extended and emphasized state function. Economic growth was seen as en extremely important condition for development and in some interpretations even as synonymous with development.
The benefits of growth were then assumed to "trickle down" through the structures of the society and reach everybody (the harmony perception). If this process did not function adequately, then the state should secure the socially desireable level of distribution of benefits.
Finally, a certain delay in the distribution process was not regarded as a problem, because it could be regarded as a necessary phase before the society could start the growth process.

This growth oriented development view was concerned with the endogenous process and was on international aspects supported by general theories about free trade as a prerequisite for the international development process. The two bodies of thought were not theoretically connected, but regarded as interdependent.
Already in the fifties and sixties there was naturally some discussions and theoretical divergencies on this dominating development perception. The impact of the growth orientation on the development strategies and aims of both the international organisations and the majority of developing countries was, however, very strong due to the political and economic dominance of the

western societies, where this orientation was dominant. Although the shortcomings of the solely growth oriented strategies were gradually recognized during the seventies as described in section 4.4, the concept is still today having influence on the development strategies in many countries.

4.2. Cost-Benefit analysis

The cost-benefit analysis approach is as already mentioned the most widely used set of rules for determining whether an activity or project should be undertaken from society's point of view.
In practical analysis situations the method may be elaborated to very different levels, depending on the specific conditions such as available skills and resources, importance and size of the analyzed activity, etc. The underlying principles, however, are the same. On the basis of the welfare economy assumptions and the principles of rational decision making, CBA is basically an attempt to transfer and adapt the procedures of traditional industrial financial profitability analysis and develop it for use on the level of society as a whole. At the same time the emergence of CBA was, however, also a result of the recognition of the shortcomings of strict financial criteria as basis for society's preferences.

The name cost-benefit analysis indicates that it is the rational decision principle of comparing benefits to costs that is the basis of the method, in relation to the financial analysis there are, however, important differences in the answers to some of the basic methodological questions:

- What costs and benefits should be included?
- How are these costs and benefits priced?
- How are costs and benefits weighted and compared over time?
- Which restrictions are effective or should be assumed?

The concept of CBA is not static, and the answers to these meth-

odological questions have therefore been changing over time. The answers will also generally vary extensively depending on whether they come from theorists or practitioners, but even within these categories, it will often be possible to get very different responses. This is evident when one studies the immense amount of literature on both theoretical aspects and practical cases. (See e.g. ref. [1], [10], [11], [24], [30]).

The presentation here will first focus on the basic principles of what is here called "traditional CBA" and not take up any of the more technically-oriented discussions. (In section 4.5 some of the more comprehensive approaches will be outlined.)

The fundamental principle of CBA is that all direct, indirect and derived effects of the analysed activity should be identified and given an economic value. Since this is naturally not possible in a practical analysis, an unambiguous answer to the first of the general questions cannot be found, but it is left up to the analyst or decision maker to identify and select the important or relevant effects, which means that the first value-judgement of the analysis has to be performed at this point.

The next question about pricing of the identified costs and benefits is the aspect about CBA that has received most theoretical attention. This is partly due to principle of economic valuing of all effects, which naturally will cause problems if the aim is to do it in a consistant way. The term "intangibles" is used as a common denominator for all effects that are not involved in normal market trading, such as the value of life or death to take some extreme examples or more relevant aspects like environmental consequences, etc. The other main reason for the attention to this question is that the pricing rules in basic CBA involve a number of ideal assumptions about society that inevitably reduces the value of the results in practice.

The traditional CBA uses the direct market prices on all effects, where a market already exists. This principle is founded on two basic assumptions in addition to those mentioned in

relation to general welfare economics. The first is that the market is perfectly competitive which means that market prices also reflect the social prices. The second assumption is that the analysed activity may be regarded as marginal to the economy as a whole meaning that the market prices will not be changed as a result of the execution of the project. The analysis is then based entirely upon the existing market prices, where the effects have a market. For intangibles a "shadow price" is assumed reflecting marginal social costs, when possible. Otherwise the effect can be either described verbally in addition to the quantitive calculations or more commonly simply omitted.

Because the assumption of perfect competition is only a theoretical possibility, a lot of effort has as already mentioned been devoted to finding pricing rules for costs and benefits. One of the obvious differences between market and social prices in practice is the various taxes, duties, subsidies, etc. that are used as part of state regulation, and one simple price rule is therefore that social prices can be found as market prices corrected for all state regulations.
Another pricing principle particularly used in the calculations of indirect individual benefits is the concept of "consumer's surplus", which is established as the difference between the "willingness-to-pay" (WTP) of the individual and the actual market price or marginal social cost. Based on the general welfare assumption that the preference of the society can be established as a sum of the individual preferences, the social effect can be found as an aggregation of the "consumers' surplus". The establishment of the WTP is evidently very important and is usually either done by some general assumptions, or if possible the relevant groups of "consumers" can be interviewed directly.
In the same way there are various pricing principles for the more direct cost side. One of the methods with largest practical impact is that of "opportunity costs", where the individual costs of the different factors are based on the best alternative use of the involved factor. The principle is also regarded as a way to express whether a factor is scarce or abundant. A typical

example of opportunity pricing is in relation to wages. The alternative costs for society of using an unemployed person will usually not be the same as the standard wage. This is a result of what the CBA literature calls imperfections or distortions of the market, and the labour market is traditionally influenced by many regulations.

As stated earlier, the purpose here is not to enter into a detailed discussion about the various technicalities. Their importance for the actual result of an analysis is recognized, but they operate within the general principles and theoretical foundations of the CBA, and seem rather redundant in relation to practical applications.

The third methodological question about how to value the effects over time has generally been answered by discounting all the individual costs and benefits from the expected year or date where they are effectuated to the starting point of the analysis. The principle and the evaluation criteria used are similar to those of financial analysis and the criteria used are composed of:

Net Present Value (NPV)
Internal Rate of Return (IRR)
Benefit-Cost Ratio (BCR).

The NPV is simply a monetary sum of all the individual discounted costs and benefits and similar to that the BCR is found by adding up all discounted benefits and dividing this figure with the total discounted costs. The IRR is by definition the rate of discount which makes the NPV equal to zero.
The NPV is the most commonly used, but its value is limited by the fact that the resulting figure is not related to the size of the activity meaning that a large project with a fairly low return might still give a higher NPV-value than a small project with a high return. If the economic resources are not restricted this is not a problem, but as stated earlier capital is nearly always regarded as scarce in public development planning. The NPV calculation is therefore often supplemented by one of the

two other criteria because both express a relation between the relative size of costs and benefits.
Before any of the described criteria can be used, there are, however, some general considerations that have to be made concerning the time horizon of the analysis and the appropriate social rate of discount.
The period considered will normally either be a selected standard period used for all public investments, typically ten or twenty years, or it will be related to the lifetime of any involved hardware installation. In projects with long-term development or environmental consequences it will generally be a problem to find an appropriate period. This problem is emphasized by the difficulties of selecting a social discount rate, because the impact of long term effects on the NPV or the other criteria are naturally very dependent on this rate. There is no general method for finding the social discount rate, and various principles can be applied. Defining a social opportunity cost of capital by looking at alternative uses and their possible rate of return is one possibility, but any choice will be a political value judgement about the importance and expected growth of welfare in the society. In practice a common discount rate for all public investments will often be selected politically and may be supplemented with one or two alternatives to test the sensibility of the analyzed projects with regard to the interest rate.
Sensibility analysis and the treatment of uncertainties can be performed in this way on all parameters considered necessary by the planner or the decision makers, but in the traditional CBA usually only a limited number of parameters are analyzed in this way and systematic use of probability methods are not included. In the simplest cases a "risk-premium" is simply added, either as a percentage of the costs or as an increase on the discount rate.

The last of the general questions about the principles of CBA is concerned with the necessary restrictions on the analysis or on the assumptions about the society in order to make the use of CBA for public investment possible. To a large extent the

question has been answered already by the general assumptions based on welfare economics and rational decision theories. The general assumption about the society being in a Pareto optimal situation as a basis for the analysis is very hypothetical particularly in relation to development projects, but naturally necessary in order to complete the ideological framework established to support the use of CBA methods.

This framework will be critically discussed later, while the next section will present a short historical background for the use of CBA in the analysis of development projects and a presentation of some of the changes withing development perception that have led to a need for more comprehensive analysis methods.

4.3. CBA and development projects

The first discussions about the insufficiency of strict financial profitability as a public decision criterion can be identified as far back as the mid-nineteenth century [44], but it was not until around 1930 that the basic principles were more systematically used in the USA. The first applications were large flood control projects, where the particular need for valuing benefits made a CBA approach necessary. During the fifties the use of CBA increased significantly, mainly in relation to large infrastructure activities and it is still in this context that the method has its widest applications in developed countries.

When the applications in relation to analysis of development project are examined, the role of the World Bank seems to be important partly because it was the first international organisation to deal especially with development problems, and also because the Bank still is a very influential organisation in terms of its economic resources, analysis and research capacity, etc.

The original function of the Bank was established in the formal name of the institution being "The International Bank for Re-

construction and Development". In the first period after the Bank was founded its activities were specially focused on re-establishing the infrastructure in the developed countries where it had been damaged during the Second World War, but from the early fifties the activities were gradually oriented more and more towards developing countries and in the mid-sixties this shift in orientation was almost total.

The main function of the Bank in relation to development was especially in the fifties and sixties seen as support for establishing the basic infrastructure in the borrowing countries. This type of activities was regarded as prerequisite for economic growth, and the prevailing development strategy pursued by the Bank was based on the earlier described theories about economic growth as the main determinant and aim of the development process.
Through the extension of the institutional framework by establishing the International Finance Corporation (IFC) and the International Development Association (IDA), the role of the Bank gradually became more comprehensive and included support to directly productive activities mainly within industry but also in large scale agriculture. Furthermore, the analysis and policy development activities also expanded implying greater emphasis on "policy guidance" of the borrowers.

The extension of the activities both in scope and volume was, however, not based on a change in development strategy. The basis was still a growth oriented strategy and the new areas of interest were merely seen as other ways of supporting the economic development/growth process.

On the basis of the position, strategy and role of the World Bank, it seems almost inevitable that CBA should become an important tool in the analysis of the activities the Bank was considering engagement in.
The theoretical foundation of the Bank was welfare economics with a strong emphasis on economic growth as the central development parameter of the society. This foundation also reflects

the political mission of the Bank as promoter of the western capitalistic ideology. The main practical field of interest was infrastructure development, an area where CBA methods already had a strong tradition especially in the USA.
This theoretical, political, and practical background along with the specific function as a banking institution with a principal interest in the possibilities for repayment by the borrower, led to a strong focus on the economic aspects of the analyzed activities. The use of CBA methods was therefore considered to be a very important element of the Bank's appraisal work, and because the theoretical foundation and the underlying development strategy were politically regarded to be universally applicable, the transfer of approach and analysis methods were strongly promoted through seminars, courses, recommendation of or demand for CBA analysis of the prepared projects, etc. [5]. The introduction of CBA in the analysis of development projects is naturally not only a result of World Bank influence, but the Bank is used here as an exponent for the mainstream approach, and there is no doubt that the Bank especially in this early period of development support did have very great influence, and the institution is still probably the most powerful international organisation in terms of economic sources and political support.

4.4. Changes in development conception

During the sixties criticism of both the theoretical basis and the practical results of the growth-oriented so called "modernization" strategy grew, both in the developed and many of the developing countries. There was growing evidence of practical project failures and political recognition of the shortcomings of growth-oriented development. Economic results did not necessarily lead to general development, the effects did not "trickle down" from the small powerful and privileged groups to the large, poor and underdeveloped parts of the population. Several directions in development theory emerged as a result of the criticism of the "modernization" strategy, and it was

characteristic that development problems were gradually recognized as much more complex than the earlier approaches had been able to express. This recognition was also reflected in both the variety and complexity of the emerging theories.

The international debate and theoretical approaches can roughly be divided into two main directions focusing on the international/external relations and on the internal factors, respectively. The two directions reflect the division of welfare economics into the external free trade orientation and the internal economic growth orientation described earlier. As mentioned previously, the two directions are not directly connected but regarded as interdependent.

The external direction will not be discussed in great detail because the relation to project analysis is of a more indirect nature. Therefore only the key concepts from the debate will be mentioned.

The first major theoretical approach was established around the concept of "dependence", and the basis was a critique of the conventional view of international trade relations, and the formulation of a whole new conceptual framework based on a centre-periphery system, in which only the central, developed nations benefitted from the trade with the peripheral, developing nations. The development strategy associated with this view was therefore based on the ambition of changing this dependence, for example through import substitution industry, control of multinational companies, state interventions, etc. The importance of this direction has gradually decreased during the seventies but many of the concepts have been integrated in some of the more recent theories.

The two dominant lines in the debate in the seventies were centred around the concepts

- Interdependence, New International Economic Order (NIEO)
- Self-Reliance (SR).

There are no precise definitions of these terms, because they can be used in different political and ideological contexts, but broadly speaking interdependence is a wider and more comprehensive view of international relations than the system presented in the dependency approach. The centre-periphery view is largely continued but also the relations and differences between the individual centre and periphery nations are considered as leading towards a more integrated view of the world system. The interdependence concept implies that changes in the international relations are a prerequisite for development in the periphery, and the formulation of the demands for a New International Economic Order in the seventies were an attempt at the political level to express many developing countries' wish for either basic or more reformistic changes in international relations.

The term "Self-Reliance" expresses in some ways the opposite direction from interdependence suggesting either national SR or more likely a collective SR, where countries in the periphery aim at increased collaboration and gradual independence of the centre nations.

The concepts in this external direction of development theory have only been described very superficially. For a detailed presentation reference can be made to e.g. Hettne [31].

The theoretical approaches focusing on the internal factors can be centred around two key concepts

- Redistribution with Growth (RwG)
- Basic Needs (BN).

Both approaches grew out of the recognition of the fact that economic growth in itself did not necessarily lead to the elimination of poverty or fulfilment of other general development aims.

The RwG approach does not represent a clear break with the

earlier modernization strategy, but the simple and ideal assumptions about harmony in society and the role of the state have been questioned, and the problems related to the unequal distribution of the benefits of economic growth are recognized. The developement strategy concept behind the RwG concept is still focused on economic growth as a key parameter but at a more disaggregated level, where the identification of different income groups and weighting of activities that lead to growth of income for the low-income groups are important new components.

The Basic Needs (BN) concept is quite different from RwG in that that it introduces a sort of bottom-up approach, where Basic Needs of the people are identified first and then the means of achieving these needs can be discussed. It is very difficult to discuss the concept of BN in general terms, because everybody will agree to the principle idea, but disagreement starts, when the not very concise terms "basic" and "needs" are to be defined, and the means for achieving these aims are discussed. Hettne [31] distinguishes between two qualitatively different approaches called:

- Basic Material Needs (BMN)
- Basic Human Needs (BHN).

These approaches are not distinct schools of thought, but idealized polar opposites in the debate with a variety of interpretations in between.

BMN refers generally to the needs that are considered necessary for survival and physical reproduction like e.g. adequate food, shelter, safe drinking water, clothing, etc. Definitions in this end of the scale define a kind of minimum level which becomes the first aim of development efforts. This "minimum needs" approach is in practice close to the RwG ideas, although it is more specific in the directions towards both the particular needs and the particular groups of people, but it does not necessarily lead to rejection of the growth orientation, which may still be regarded as a prerequisite for the ability to meet the minimum needs.

The BHN is in contrast to the BMN a qualitative concept, where the material needs are naturally included but as part of wider political and cultural context, and the various components cannot be dealt with separately. Because of its qualitative and dynamic nature, the BHN concept has to be defined in connection to the specific societies, but it is difficult to identify general development strategies aiming at BHN, where qualitative changes are favoured at the expense of the growth orientation.

This broad introduction to some of the major new approaches and directions in development theories and strategies is intended as an illustration of a trend towards a more varied and also comprehensive understanding of development problems.
Other important areas that have been given increased focus in relation to development activities are for example social structures, ecology, and decentralisation. These new aspects are not directly related to any of the described general concepts, but a general feature is the rejection of unlimited economic growth as the central development objective and increased emphasis on long-term consequences of any planned activities.

> "In social sciences "paradigms" (if they can be so called) tend to accumulate rather than replace each other, one reason being that they may fulfil ideological purposes, even after their explanatory power (if there ever was one) has been lost". (B. Hettne, 1982)

This statement is important to keep in mind when the discussion of practical planning is taken up.

An example of the historical changes is the fact that the neoclassical approach has regained importance in the eighties due to political changes in many of the most powerful developed countries.

4.5. New general approaches to project analysis

One of the results of the general tendency towards more comprehensive perceptions of development problems and processes was a recognition of the limitation on existing project analysis methods and procedures and a need for more differentiated but also standardized new tools and methods. The growing public and political concern about the efficiency of development assistance that was mentioned in chapter 2 also pointed in the same direction.

Several of the international development institutions like the World Bank, UNIDO, OECD, etc. and also some of the large national donor agencies for example in the United States, Great Britain and France, responded to this need for more comprehensive methods by initiating a number of research activities with the aim of producing new practical analysis tools.
Because the research was based on the situation seen from the point of view of the organisations, the primary focus was on their main analysis task - the appraisal. Due to the previously described importance that is generally attached to economic viability and the fact that the reorientation in development approach was closely connected to economic questions, it is not surprising that the main objective of the research work was to find more comprehensive economic analysis methods.
The results of the research work were published during the early and mid-seventies in various reports, handbooks, guidelines, etc. [24], [43], [64]. In the following some of the methodological approaches that have received the greatest international attention, will be outlined and in the next section the impact on practical project planning will be discussed.

The main tendency in the presented results was to use the basic concept of Cost-Benefit, but to include distributional effects and also compensate for "market imperfections" experienced in most developing countries by systematically calculating and using shadow prices for a number of the important parameters in the analysis. This direction in method development is known commonly as Social Cost Benefit Analysis (SCBA).

The principal works that have dominated international discussions have their origin in three of the major international organisations OECD (Little and Mirrless, 1969 and 1974), UNIDO (Dasgupta, Marglin and Sen, 1972) and the World Bank (Squire and van der Tak, 1975). All three approaches are based on the reorientation in the development strategies that was discussed in the previous section. The strictly growth-oriented strategies were gradually changed towards also including distributional aspects and the foundation for the three SCBA guides is the development perception of Redistribution with Growth or in other terms a narrow interpretations of the Basic Needs approach, and this foundation is also a reflection of the revised strategies pursued by the organisations.

All the three approaches (OECD, UNIDO, WB) have cost-benefit analysis as their methodological base, but within this frame there are a number of "technical" differences with regard for example to calculation principles for the various components, evaluation criteria formulation, etc. In the following presentation these differences will, however, not be discussed in any detail because the ambition is mainly to show the general principles of SCBA in relation to the earlier examination of traditional CBA.
A case study by Weiss [73] also reaches the conclusion that the results of using the three approaches are fairly similar and variations are not as much a result of the technical differences as of the necessary value judgements that the user has to make or get from the political decision makers.

SCBA in many ways represents a break with many of the idealized assumptions about society that was the basis for traditional CBA approach. It does not, however, mean that the ideology of welfare economics is given up, but mainly that the perception of society is more comprehensive.

The potential Pareto improvement, which was the background for the general welfare criterion in traditional CBA by arguing that a potential compensation between gains and losses of a project

was sufficient, has been both practically and theoretically criticized, because of the lack of possibility for accomplishing the actual compensation. In SCBA this problem is addressed in two ways. First of all by defining a specific welfare function and a specific "numeraire", which means that instead of calculating a potential general improvement, the analysis aims at finding a specific figure based on the actual gains and losses. Secondly this figure is found using specific in principle politically determined values for the distribution of benefits and costs for a number of identified groups in the society.

The values for the distributional aspects are part of a whole specific set of national parameters necessary for the SCBA. The idea is that this parameter set should be established either politically or by a central high-level administrative planning unit, and used in the decentralised project analysis activities at sector level. There is no unambiguous definition of what parameters should be determined in this way, but the general aim is to include all the important factors where political value judgement is involved, like distributional weights, accounting/shadow values for social rate of interest, exchange rate, wage rates, etc. These factors should therefore be a detailed expression of the overall development strategy and the different political aims of the specific country. This is naturally also a distinct difference from the CBA approach, where the result of the analysis was a reflection of the general statement of economic growth as the central and universal aim.

A third area, where differences between SCBA and CBA are significant, is the methods for establishing the "right" prices for the analysis. The assumption about perfect competition is totally rejected and elaborate rules are established for calculation of shadow or as they are generally referred to in SCBA litterature - accounting prices. Without going into a detailed presentation some of the principles for estimation of the different types of accounting prices will be outlined.

Dealing in general with commodities the market in most developing countries is regulated by taxes, subsidies, trade restrictions, etc. and the price used is therefore the border price, which is the price the specific good could be sold for in international trade. Since not all commodities are traded internationally, there are different rules, if the good is not traded such as in normal circumstances water, electricity, etc. In this situation the price is established by decomposition of the good into traded and non-traded components, where the traded items, and the remaining non-traded components are usually calculated by using a general conversion factor, which is established as a general figure relating the direct cost to the accounting price system.

In the analysis of accounting prices on the various categories of labour, it is generally accepted that market prices are highly affected by agreements and contracts making accounting prices necessary in order to find the "marginal social costs" of the individual types of labour. The accounting price is usually found by separation in two components, one related to the marginal productivity, which is a figure for the eventual loss that occurs by employing a person in the analyzed activity instead of alternative use. The other component is related to the increase in consumption that may be a result of employing the person. This is one parameter where the distributional aspects can be included by attaching different values to consumption for unskilled rural labour and urban academics for example. The policy value is used reciprocally meaning that an unemployed person (marginal productivity close to zero) in a high priority low-income group will have an accounting price close to zero. In a similar way calculation rules exist for finding an accounting rate of interest and a shadow exchange rate for the local currency, but it is not found necessary to make a description of these rules, since the principal difference between SCBA and CBA should be clear from the other examples of calculation rules for, what in the SCBA is regarded as some of the essential "scarce resources".

When all costs and benefits that are considered relevant have been identified, calculated and weighted according to the methodological principles and the political value parameters, then the yearly results are expressed in the specific numeraire and discounted to the selected starting year using the accounting discount rate. The evaluation criteria are generally the same as in CBA using either the Net Present Value (NPV), which in order to avoid misunderstanding is usually called the Present Social Value (PSV) underlining the fact that social accounting prices have been used, or the Internal Rate of Return. Both criteria are calculated in the same way as in the traditional CBA.

The two remaining aspects that were discussed in relation to CBA are respectively the time period considered and how to deal with uncertainty. Both aspects are handled in the same way as described in relation to CBA. The period considered is usually connected to the lifetime of central components, and if this approach is not possible then a standard term of for example ten or twenty years is used, depending on the type of activity being analyzed. With regard to uncertainty and sensibility to changes in the involved parameters, a number of possible methods are discussed ranging from the use of probability functions for the key parameters to derive a probability profile for the PSV and to simple calculations of a few alternatives or using a general risk premium.

It should be evident from this summary presentation of the general principles of SCBA that the basic structure of the analysis is the same as in the traditional CBA, but the idealized view of the society has been changed in a more comprehensive direction. Still external and indirect effects are largely excluded from the SCBA. The projects analysed are also still assumed to be marginal in relation to society meaning that they will not themselves lead to significant changes in the underlying assumptions or affect the price levels.
The three major SCBA works do as mentioned use different numeraires and also the principles for calculation of many accounting prices are different. The international debate about SCBA has

partly because of these differences, been centred around the technicalities of the methods, either based on critique of the underlying theoretical approach or founded on practical case studies, where the different methods have been applied.

The original intentions with the developed methods were naturally that they should be applied in the developing countries, and the idealized planning structure was expected to consist of three levels:

Politicians/Decision-makers
↑ ↓
Central Planning Office
↑ ↓
Decentralized project formulation and analysis

Where the Central Planning Office (CPO) is the institution with responsibility for macro-level planning and coordination of the decentralized activities. Furthermore the CPO should establish and maintain the set of national policy parameters necessary for the use of SCBA.
How to establish an administrative structure like this and especially how to find or train the necessary staff for the CPO and the actual sector level analysis tasks are not decribed in any detail in the reports. In the OECD approach [43] it is vaguely stated that this structural set-up "may well be unrealistic for the immediate future ... . Nevertheless it should normally be possible to overcome this difficulty within a few years".
In the discussion of the practical applications of the SCBA methods, these fairly idealized ideas about administrative capabilities in the developing countries have naturally also been subject of much criticism, and as illustrated in the description of the Zambian case [22], where the actual structure is similar to that described, the assumption about the macro-level planning capacity and possibilities are quite unrealistic.

The SCBA methods are in all three approaches designed for analysis of what is generally called productive activities covering industry, agriculture, infrastructure, etc. where evaluation of the output is less problematic than within health, education and similar areas, where the output is closer to being intangible. No attempt is made to include these areas in SCBA, but it is generally recommended to apply a Cost-Effectiveness Analysis (CEA), which is basically either a traditional CBA or a SCBA, where only the costs are calculated in economic terms, while the benefits are found as the direct output in indicators such as graduated pupils, treated patients, etc. The evaluation criteria is then usually the Cost-Effectiveness Ratio expressing the discounted costs per unit of the chosen indicator. This also indicates that the method only has applications, where different solutions to the same problem are being analyzed, because both the indicator and the ratio are specific for the problem. The principle can also be applied to activities with more complex goals, and used here to find the least-cost alternative.

The CEA is a way of avoiding the politically very sensitive task of valuing the intangible types of benefit and still maintaining the basic welfare economic approach to project analysis. In principle political weights could be applied to the benefits, if special groups should be favoured, but due to the character of the benefits such weighting is usually not included. The general relation to the aims of the society therefore tends to be described in qualitative terms.

The development of the different SCBA approaches, which together with the vast amount of case studies and theoretical discussions that have been published represent the mainstream and quite dominant tendency in appraisal methods. The debate about the approaches was naturally most intense in the first years after the publication of the major works, but even in the more recent years several reports [1], [60] have contributed to a continued debate, but without suggesting new major differences or elaborations in relation to the general principles described earlier.

Another general method for the appraisal of development projects was presented in almost the same period as the SCBA methods emerged. In the following this approach will be broadly discussed and compared with the principles of SCBA. These so-called "Effects Methods" (EM) [17], [18], [6], which are closely connected to French administrative traditions, seem to be the dominant approach in Arab countries and the former French colonies [33], and it has also been advocated by the European Development Fund [39], but its practical applications have not been studied in this project.
The EM is generally described as a planning tool because the ambition is to perform the analysis in a central planning unit in close dialogue with the political decision makers and with the aim of establishing a coherent plan for the total activities. The approach is therefore also based on a highly centralized planning system, where the project ideas and proposals are prepared by decentralized planning boards, but the analysis, ranking and selection are performed in collaboration between the central planning unit and the political decision makers.

If the EM is compared with the SCBA methods, there are a number of distinct differences. First of all the fact that the EM does not use one aggregate objective. Instead the individual effects of the planning activity on a number of different politically selected criteria are calculated. All prices are in principle domestic market prices, but the internationally traded inputs and outputs are expressed in international prices converted to the national currency by the official exchange rate. No shadow prices are used in the analysis, because the implicit valuing is not wanted as a part of the analysis. The planning unit therefore produces a comparison of the economic situation in society with or without the various projects based on the effects on the different central criteria. It is then up to the political level to make the decision about weighting the different criteria against each other and selecting the projects that meet the general objectives in the best way. The process is regarded as iterative and may be used to examine different development paths or different political priorities, for example

through changing or expanding the analysis of effects on other social categories or maybe regions. The open-ended structure allows for a number of different more or less aggregate evaluation criteria to be introduced, if it is found desirable by the political level.

If the same set of political parameters were used to study a project using the SCBA and the EM, the result may basically be expected to be quite similar. The main difference is in the procedures, where the political judgements in the SCBA are a part of the analysis work and the result aggregated to a single criterion, then the EM makes a comprehensive analysis of the effects and leaves the political judgements to the decision makers. This difference is naturally very important because the EM makes the political aspects of the project selection procecures very clear, but it also makes very high demands on the interaction between central planning and policy makers.
These high demands are naturally also one of the practical problems related to the use of the EM. Other problems are e.g. the need for detailed data about the main agents in the economy for the analysis of the "with-or-without" situations, and the fact that the three general categories used to classify projects (import substitution, modernisation and export) implicitly limit the relevance in relation to other types of projects and put emphasis on activities that have effects on the balance of payments.

Both the SCBA and the EM approach represent tendencies towards more comprehensive project analysis methods, where the political aims are treated in a more differentiated way than in the earlier traditional Cost-Benefit analysis with strict focus on economic growth. The principle of attaching economic values to both costs and benefits is, however, still an essential aspect that limits the possibilities of including more qualitative aspects.

Looking at the general tendencies in the international debate about project analysis methods in the last decade, it seems that

CBA/SCBA still is the dominant approach, as it is illustrated in the next section on practical applications. But the importance attached to the economic analysis on behalf of other aspects is gradually changing. Many of the national aid-agencies and some of the international organisations are devoting increased attention to studies of social impact and also lately to environmental consequences. This can be done by separate presentations of the different analysis and then using policy priorities in the selection as in the EM. The economic result can then be balanced against the effects on the other types of criteria and the priorities naturally reflect the development strategy of the organisation or country involved. Another common way of including environmental impacts is to identify both the direct and indirect consequences and include costs for e.g. restoration of resources and other direct measures for quantifying the effects in the SCBA. This approach naturally has the general problems of putting values on many consequences of an intangible nature, and because many environmental effects are of a long-term nature, the principle of discounting the values is problematic, and suggestions have been made about leaving it out unless the analysis only compares different solutions with the same environmental consequences.

Other tendencies and methodological approaches can be found particularly if the individual elaborations on country or organisation level are studied, but the purpose in this section has mainly been to present the general principles of the mainstream approaches and to show how the changes in development preception have affected method development. In the next section the actual practical implementation will be discussed on the basis of the experience from the Zambian administration.

4.6. The use of project analysis methods in practice

In describing the impact of the methods on practical project analysis, it is necessary to make some generalisations, since most international and national organisations involved in de-

velopment planning have their own rules and procedures and a detailed description would lead too far in this context. The use of analysis methods will therefore be discussed in relation to three broad categories of organisations

- International development banks and major UN organisations
- National aid-agencies and minor international institutions
- National administrations in developing countries.

It is recognized that there are very large differences within the groups and some organisations may not follow the general patterns, but at this general level of discussion, the categories are considered to be satisfactory.

It is evident from the presentation of the SCBA methods that they pose high demands on both the administrative capacity and the available qualifications within the organisation responsible for the analysis. The analysis work must of course also relate to the proportions of the activities studied meaning that SCBA will be relevant mainly in relation to fairly large projects. It is therefore not surprising that it is mainly the international development banks that have tried to implement the total SCBA approach. The comprehensiveness of the analysis naturally depends on the type of project studied, available data and policy priorities. But because these organisations often perform both general country studies and more detailed sector assessments as background for their project identification, they establish their own set of data and policy guidelines to be used in a SCBA of the major identified projects.
As described in the empirical report [22] on Zambian planning procedures, this process for example performed by the World Bank tends to be quite autonomous in relation to the country under study, but naturally with large effects on general project identification.

In the presentation of the methods the traditional CBA and the SCBA were clearly distinguished, but in practice elements from both approaches are commonly joined together in what could be

called an extended CBA. This intermediate level is probably the most widely used in national aid-agencies and in some cases also in both the international organisations and the national administrations. The level of analysis used will usually be a result of a compromise between the administrative capacity, available data, size and type of the project, etc. and naturally also the emphasis that the organisations attaches to the economic aspects in their development strategies. It is not possible to define this type of extended CBA precisely, because it can be anything from an approach where one or a few shadow prices are used in an otherwise traditional CBA to simple SCBA's, where simplifications have been introduced in order to limit the analysis work. An example of guidelines for economic evaluation used by the Inter American Development Bank (IADB) is shown in Appendix A. These guidelines are an example of a fairly elaborate CBA using a number of SCBA techniques particularly with regard to shadow pricing, but basing the analysis on a general welfare function without a specific numeraire. The distributional aspects are handled in a separate analysis so value discussions are avoided and sensitivity is analyzed by calculating the NPV for different values of the principal variables.
This level of analysis is probably the most common in the larger international organisations, when the project is not part of a larger integrated effort.

In the aid-agency context the emphasis on economic viability is often not as strong as in the banking institutions, since a large proportion of the assistance is often given as grants or "soft" loans with no real expectations about repayment. The efforts devoted to the economic analysis naturally reflect this attitude, but can vary significantly from project to project and between organisations. In the main appraisal performed by the aid-agency the approach most commonly used will be some type of extended CBA for the economic analysis of the different designs of the same project, supplemented by studies of the impact on social, administrative and environmental aspects, and the decision is then based on a comparison of the results. The CBA approach may be similar to that of the IADB guide, but it is

highly dependent on the type of project and the emphasis on economic viability within the agency. On the policy level economic viability may be described as only one criterion among a number of equally important criteria, but on the detailed level it would probably be difficult to pass a project with directly negative economic results even if the score on other criteria is high, but this situation can naturally be avoided by "appropriate" benefit valuing. As mentioned in the general description of project appraisal (see chapter 3) the proposals that have reached appraisal stage are rarely rejected, but the analysis can lead to considerable changes in the design of the project. The first commitment to a proposal is usually at a much earlier stage of the project cycle, and the analytical basis for this commitment is much more limited than that of the appraisal. It is difficult to generalize about the analysis activities in the identification and preparation phases, because the level of activity is very dependent on the source and nature of the proposal. If the type of activity is well known and the agency has long experience in the specific area, the analysis will be quite limited, but if it is a new type of activity more detailed studies will be conducted covering more qualitative aspects like problem analysis, target group, accordance with development aims of both the country and the agency, etc., but also technical, institutional and economic aspects are considered. The economic analysis will, however, usually be based on a traditional CBA and mainly function as a general check on the feasibility of the activity, perhaps supplemented by a few sensitivity calculations. In practice many of the basic selections among project ideas or proposals may therefore be based on traditional CBA as regards economic aspects, while the detailed design and elaboration of the selected projects is analysed with the extended versions of CBA.

This widespread acceptance of more or less comprehensive CBA methods as an important tool in the analysis of economic viability of development projects has naturally also had a great impact on, how this type of analysis is performed at both sector and national level in developing countries.

The described general tendency towards micro-level project planning as the actual manageable level of public planning has also led to an increasing need for improved project analysis and better methods and tools for both preparation and selection of projects.

Already in 1975 Birgegård [5] found in his study of the project selection process in Kenya that traditional CBA methods were widely used on a project-by-project basis especially if donor funding was involved. The analysis would usually be performed as a traditional CBA, discounting expected costs and both direct and some quantified indirect benefits at market prices using net present value (NPV) or internal rate of return (IRR) as profitability criteria. No shadow prices or distributional aspects were normally included unless required by a potential donor. The use of CBA was seen as a result of donor influence both through their demand for this type of analysis in the projects, where they were involved, and through extensive training activities, seminars, sponsoring of formal post-graduate education of administrative personnel, publishing of guides, manuals, etc. Birgegård did, however, not find that CBA was used systematically as a tool in coordinated micro-level project planning. The results of the profitability analysis was not used to rank or select between projects e.g. from different sectors, but only as basis for deciding to accept or reject the individually analyzed project or programme.

This experience from Kenya in the mid-seventies is in many ways similar to the way project analysis is performed within the Zambian public administration, as it has been described in the empirical report about project procedures [22].

In practice projects in Zambia are analyzed both at the sector level, in this case the Department of Energy (DOE), and at central administrative level by the institution called the National Commission for Development Planning (NCDP). The structure resembles the one described in the SCBA guides as a prerequisite for the use of SCBA methods in project planning, and officially

the NCDP claims that their analysis activities are based on the UNIDO-SCBA guide. In practice, however, the analysis activities are limited at the central level, and projects are usually approved on the basis of the recommendation from the sector level especially if a donor is already partly committed to the project. In special cases a more comprehensive analysis may be conducted using parts of the SCBA principles, but it will not exceed the level of an extended CBA and hardly even be close to the described guidelines of the IADB.

On the sector level the experience is very similar to the above described Kenyan one. Traditional CBA usually without any extended features will be used on a project-by-project basis using NPV or maybe IRR as the standard criteria. The analysis is mainly used in an accept/reject situation or to choose between alternative technical solutions to the same problem. General lack of adequate data and the scarce administrative resources make studies of social, distributional and environmental impacts impossible, even if the need for these types of analysis is recognized. The use of the traditional strictly growth oriented CBA approach does not therefore necessarily express the actual development perception, but it is rather a result of the practical restrictions on the volume of the analysis and the fact that no clear set of political parameters have been established for the necessary value judgement. It is perhaps not even politically feasible to enter for instance direct distributional aspects in the analysis?

It is evident from this presentation of the practical use of analysis methods that CBA methods at some level of detail are very widely used, and the critical discussion in the next section will therefore concentrate on them.
The presentation has, however, even if it is based on both direct and indirect contacts with a number of international organisations and aid-agencies and the direct collaboration with the Zambian government, been oriented strictly towards what could be called the Anglo-American traditions. It has therefore not been possible to enter into any discussion about the practical use

of the Effects Method, which is claimed to be widely used in countries based on French traditions [33], it can only be stated that this approach has no significant importance in the studied organisations.

4.7. Critical discussion of project analysis methods

In the general presentation of the different methodological approaches some of the more problematic issues have inevitably been commented directly or indirectly, but no systematic discussion has been performed. The aim in this section is therefore to look at some of the central aspects and discuss them critically, especially in relation to practical applications. The discussion will therefore focus on CBA and SCBA, since these are the only methods where practical applications have been found in this study.

There are generally three levels of comments and criticism in relation to CBA/SCBA, these are

- the theoretical and ideological basis,
- the methodological principles, and
- the practical use of these methods.

It is important to distinguish between the three levels in the discussion, but it is equally important to be conscious about the connections between them.

The basic question that the project analysis is supposed to answer is, how to find the activities that society as a whole would prefer. The definition of the objectives or preferences of the society is therefore the first theoretical question, which needs to be answered.

In the traditional CBA approach, the answer is simply that the society should prefer the activities that, based on economic valuing of all costs and benefits, will give the best total re-

sult. This is what in planning theory is called a rational choice, and obviously nobody likes to be accused of being irrational in a selection process, which is supposed to be neutral and objective. The general problem in practice is, however, that it is naturally not possible to include all the various effects in the analysis, and therefore choices with clear impact on the results of the analysis have to be made right from the start. In this connection the use of economic values as the measuring unit will inevitably lead to favouring of the effects where the economic value can be established without too much effort. The discussion about how to deal with the intangible effects is a clear example of this situation, and the use of the individual's "willingness-to-pay" is no help in relation to many of the effects, where pricing becomes an ethical problem e.g. within health, ecology, etc.

The basic welfarism view of the society as a harmonic unity, where the function of the state is to secure the harmony and seek to promote development that will benefit everybody through a "fair" distribution of the results of economic growth, is very unrealistic in general and especially in relation to most developing countries, where the societies are characterized by very large differences in the existing distribution of wealth, and conflicting interests between various groups in the society due to rural/urban relations, tribal and ethnic traditions, religious differences, social class interests, etc.
Assuming that the existing weak state structures are able to secure harmony and "fair" distribution of eventual development results is also without any bearing on reality. As an ideological basis the harmony perception is naturally attractive for those in power and rich, because it will tend to defend the existing social structures.

How different then is the view of society and the role of the state in the SCBA approaches? Since one of the main reasons for initiating the method development was a general recognition of the lack of success of the strictly growth oriented strategies some significant differences could be expected. On the general

descriptive level this is also true. The problems related to the existing distribution of wealth and the need for more specific and comprehensive development aims are emphasized in the SCBA guides, but very little consideration is given as to how this should be achieved in practice. The precise definitions of the objectives should be formulated in a set of political weights, which are essential for the possibilities of performing a SCBA. But how could the different groups in a society that was just characterized by unequal distribution of wealth be expected to agree on a set of political weights that should aim at a more equal situation? This seems to necessitate the traditional harmony perception of the society again. There is in fact a direct contradiction between the ambition of defining precise objectives and the harmony view. One of the reasons for the usually very general formulation of aims is therefore that it is the only level at which concensus between the different interests can be obtained. It is also rather unconsistent to assume that a state should have better possibilities of pursuing any policy aims through project planning than through other interventions. In the SCBA one of the reasons for the extensive use of shadow prices is that there are expected to be political restrictions on the state's possibilities for regulation. These political restrictions will naturally not be any different, when it comes to project implementation, and even if a project is selected as a result of policy priorities for example for low income groups, there is no policy background to ensure that benefits are actually distributed as planned. The general problem with the SCBA approaches is therefore clearly that planning methods are still basically regarded as neutral tools in deriving the "best" solutions. The inclusion of the so-called social aspects is mainly seen as a necessity in order to adapt to the "imperfections" of the societies studied. The practical implications of these imperfections on the relevance of the project planning exercise and the possibility of pursuing the social goals within the existing structures of the society, are generally not reflected. It is evident that the perception of the society in SCBA is more comprehensive than in traditional CBA, but it is also clear that that there is a general lack of consideration of political power

structures and still a very simplistic view of the role of the state. For a more in depth discussion of these political and ideological aspects of CBA and SCBA, reference can be made to Ball [3], where a more radical critique is presented.

The discussion here has until now focused on the realism of underlying general theoretical approach to decision making. The validity of more detailed theoretical assumptions can naturally also be questioned, for example that the preferences of the individuals can be treated as independent and expected to be results of economically rational decisions. These assumptions might be true in relation to a limited number af commodities, but it would require both total transparency of the market, no external influence on the decision and no limits on the possibility of executing the decision. In practice all three conditions are unrealistic due to the various existing restrictions both of political and practical nature and the influence everybody is exposed to from society both locally and nationally, traditions, fashion, prestige, etc. It is also important to bear in mind that the concept of rationality is closely related to western societies, and for instance in a rural community in a developing country the interpretation of the term, if it existed, would probably be very different due to other cultural and value standards.

One of the central points of criticism is therefore also that the CBA/SCBA methods that have been developed in one type of society are transferred directly to very different types of societies without any reflections about the problems and consequences related to this transfer. This discussion is resumed in the concluding remarks in chapter 8.

When the level of the methodological principles is addressed there are obviously significant differences between CBA and SCBA in the elaboration of the individual parameters and prices. The ambition here will, however, not be to go into a detailed discussion of the various methods or deriving an appropriate set of prices. Many of these discussions are of a rather academic

nature in relation to the practical use in a developing country. It furthermore seems that an in depth discussion of the different pricing rules will suggest that it is possible to find some kind of calculation method by which a "true" social price in relation to the society can be established. As stated in the general discussion the "true" price is found to be an illusion in a planning situation, where political selections and value judgements are performed both through explicit political objectives and more implicitly by all the neglections and omissions of aspects and effects that are done in order to reduce the planning task to a manageable size.
The consequence of this attitude towards how to establish prices does not mean that it is not considered important. On the contrary. If CBA or SCBA are used in the analysis, it is very important to use a consistent set of prices, but the main thing is to be conscious about the consequences of this price set on the results of the analysis. The main point in this critique is therefore that it is not considered possible to establish pricing rules that have universal application. It may even be questioned whether it is appropriate to use the same pricing rules for all sectors within one nation, since in the same way that the general use of economic valuing tends to favour activities and effects where economic values are easy to establish, the use of international prices has a built-in orientation towards projects in which focus is on export or import substitution. Another example is the use of the "willingness-to-pay" and where there, at least in a pragmatic way of thinking, has to be a relation to the individual's ability-to-pay, implying that the term will have a built-in bias towards the groups with greatest ability-to-pay. In this way the critique of the pricing rules is closely connected to the critique of the harmony perception of society and the simplistic view of the state function. Both have built-in tendencies towards favouring the rich and powerful.

This discussion of appropriate pricing methods also has to relate to the planning task, as it has been stated earlier the analysis work must reflect the size and the impact of the ac-

tivities being analyzed. This aspect is particularly important in countries where analytical skills and administrative resources are one of the most scarce factors in relation to the analysis. As an example from the energy sector it is evident that a large hydro-power station and a dam that might affect a large number of people directly and society in general (the marginality can be questioned) will need a level of analysis and a set of pricing rules that are very different from those that should be used in relation to, say a charcoal stove programme, and still the responsibility for the national part of the analysis may primarily be within the same sector institution.

A general question in relation to the use of CBA and SCBA is to what extent the results of different analyses can be compared and used for ranking. In connection to the perception of three levels of public planning as described in chapter 2, the attitude in CBA/SCBA literature is that the aggregate economic results of the micro-level project analysis should only be used for ranking within the sector, while inter-sectoral priorities should emerge from the macro planning. In relation to the SCBA guides and their ambitions about a structural set-up with a strong central planning unit it is, however, not very clear how the inter-sectoral priorities should be established. The general policy parameters should naturally be the same for all sectors, but whether or not that also goes for the pricing rules is not evident. The problem attached to ranking within the sector was illustrated by the energy project examples, and the difficulties in relation to using the NPV and IRR criteria were mentioned in the presentation. It is therefore also highly questionable whether CBA/SCBA methods should be used as a basis for the comparison and ranking of significantly different projects, even within the same sector.

All this criticism seems to indicate that CBA/SCBA is completely useless in relation to the analysis of development projects, but that is not the whole conclusion of the discussion. CBA/SCBA are found to be relevant as analysis tools in relation to the specific planning situation, where several possible alternatives exist to address the same problem and one solution has to be found. The economic criterion should, however, not be the only

one used in the analysis and the calculation of prices and policy parameters should be performed in a critical manner with due consideration to the implicit value judgement.

The planning situation just described, where CBA/SCBA methods are considered to be of relevance, at least as long as no better methods are available, is in fact partly identical with the appraisal phase in the project cycle. Since the methods were originally developed for and adopted by the international development organisations this conclusion of the theoretical and methodological discussion cannot be very surprising as the main analysis task in these organisations is the appraisal. This does not mean that both the aims of the method development and the use in these organisations have been restricted to this specific area of relevance. On the contrary the efforts have been directed towards spreading the CBA/SCBA to all phases of selection. The essence of the critique is therefore that the methods have been promoted and used in situations where their validity as analysis tools at least has been doubtful and often directly misleading. In addition to that the built-in value judgements have often been neglected and the required level of detail out of proportion with the available resources.

The third level of discussion - the practical use of the methods is in relation to the general critique obviously very important.

If the structure from the presentation of the practical applications is used, it is evident that the use of SCBA or very extended CBA methods like the IADB (see Appendix A) demand elaborate political objectives and detailed data on a number of parameters. The necessary information will then either have to be supplied by the local government or by the organisation itself. In the first case there is an immanent danger of overburdening the limited administrative resources with tasks that serve no other purpose than to obtain external funds, and since the different organisations have different approaches the consequence may be as stated by Rondinelli [61].

> "While each set of requirements prescribed by each of the assistance agencies may seem rational and necessary, the collective impact of all prescriptions can impose intolerable burdens on the administrative capacity of developing countries". (Rondinelli, 1977)

In the second case where the organisations conduct their own studies there may be a great risk of getting into a situation in which the main objective becomes to ensure that the analyzed project is compatible with the policies of the organisation and its own view on what the political objectives of the involved country ought to be.
Since there has been no possibility for studying practical method use from the inside in one of the international or national agencies, it is not possible to assess the attitude towards the value judgement aspects. From the feasibility and appraisal reports submitted to the DOE in Zambia, the general impression is that only very limited if any reflections were included in these reports concerning the value based impacts of the methods. The general poverty or Basic Needs orientation of many aid-agencies was also extremely difficult to recognize in the analysis itself, and the pricing rules used were usually based on general guidelines from the agency such as the interest rate in the IADB manual (see Appendix A). The studied material is, however, too limited to be used for general conclusions.

In relation to the third general aspect of the critique it is a fact that CBA/SCBA methods are being used and promoted for use as a tool at all stages of the analysis. This means that the methods are used both in some of the early selections and also as a basis for ranking between different types of projects, where this is necessary. Both are analysis tasks where it as already mentioned is highly questionable whether CBA/SCBA should be used.

In the developing country context the effects of the external donor based demands on the analysis have already been described, and the adoption of CBA methods must therefore to a large extent

be seen as a consequence of the donor's wish for this type of information. According to Rondinelli [61] this has in many cases led to establishment of dual systems of analysis: one for projects with domestic funding and one where foreign donors are involved.
It has not come this far in Zambia or in the Kenyan case described by Birgegård [5], but there is no doubt about that the use of CBA was introduced in order to satisfy the external funding sources and the level of detail in the analysis will also be a reflection of the external demands. The function of the analysis will therefore often be to legitimize the proposed activity. Due to the general lack of reflection about the value judgement aspects, there is a tendency towards using the CBA as a basis for an accept/reject procedure in the early stages, where especially the indirect effects are unclear. The reason for this early selection is obviously that there is no reason to waste the scarce administrative resources on proposals, where donor funding is not so likely. The use of an often limited traditional CBA at this stage will very likely result in focus on the direct and easy measurable economic effects and tend to neglect the longterm, indirect and hard to value aspects. In this way the use of CBA can in itself influence the actual selections.
If the selections performed in this way were the result of deliberate choice of method, pricing rules, effects, etc. related to policy aims, it would not be criticizeable, but these methodological choices are not made in this way, because the traditional CBA is to a large extent regarded and promoted as a neutral tool.

The discussion of the practical use seems to support both the general points of criticism and the expectations about the possible neglection of the built-in political and ideological premises. It is therefore important to reemphasize the conclusion of the general critique, where it was stated that CBA/SCBA only should be used in the specific situation where alternatives to address the same problem are studied. Even in this situation the economic criterion should not stand alone because

many other aspects of the analysis are equally important. It was found that the methods have been extensively promoted and used for analysis types where they have no or little validity, and the built-in preferences have largely been neglected or found to be politically appropriate.

5. RURAL DEVELOPMENT AND PROJECT ANALYSIS

5.1. Introduction to the concept

The description of project planning and the discussion of analysis methods have until now been kept at the level of the society as a whole, but as one of the aims of this study is to look at operational methods especially in relation to analysis of rural projects, it is naturally necessary to look in more detail at the concept of rural development and some of the general problems attached to the analysis of rural activities. The purpose is not in any way to present some kind of strategy for rural development, but merely to establish some general guidelines for the project analysis function based on a fairly ideal interpretation of the concept, because more comprehensive analysis is one of many prerequisites for better rural projects. A better method can naturally not change anything in itself, but as discussed in the critique of traditional CBA, it is important to recognize the effects of the analysis method and criteria on the selection.

The first problem is therefore to establish an understanding of the concept of rural development. Just as in the discussion of planning, it is not found appropriate or possible to make a fixed definition with general validity of the concept. A framework based on some fundamental principles may be relevant in order to establish a common general understanding or approach to the discussion, while an operational interpretation will

have to be found in connection with the problems and conditions of a specific rural area.

As one of the results of the previously described reorientation in development theories and strategies in the seventies, increased attention was devoted to rural development, which was closely connected to the term "alleviation of poverty". Many aid agencies and development organisations have adopted poverty oriented strategies giving priority to activities aiming at poverty eradication.
This interpretation of rural development is, however, found to be too narrow and too oriented towards economic aspects. A more comprehensive and, in its definition of target groups also more specific view on what rural development generally should include is provided by Chambers [15].

> "Rural development is a strategy to enable a specific group op people, poor rural women and men, to gain for themselves and their children more of what they want and need.
> It involves helping the poorest among those who seek a livelihood in rural areas to demand and control more of the benefits of development. The group includes small-scale farmers, tenants and the landless".
> (Chambers, 1983)

The statement is not intended as a definition but as the basic principles that the general framework for understanding rural development must be based upon. The principles are perhaps not more operational than the term - poverty alleviation, but they underline the fact that development should be based on people's own needs and if possible also on their own control of the benefits. This is naturally a very idealistic approach, but as a basis for establishing the guidelines for the analysis it seems appropriate to start out with how it ought to be and then later modify the ideal principles in relation to the practical constraints.

5.2. The need for an integrated approach

In order to pursue the aims invested in the basic principles, it is necessary to start out with an analysis of the multitude of factors that represent the background for and foundation of the present situation. On this general level of discussion some of the causes that can be pointed out are colonial exploitation, class and urban-oriented exploitation, poor political planning and management, lack of genuine political will, lack of capital, limitations on natural resources, growing population resulting in constraints on available land. None of these factors can be identified as the single most important, and the essential part of the analysis is to identify the actual combination of factors that have resulted in the specific situation in the studied area.
The complexity of the described causes also indicates that there are no simple and universal solutions to the problem of rural development.

Due to the very general character of the presented principles and objectives, it will often be necessary to operate with various sub-objectives such as increase in agricultural productivity, safe water supply. These sub-objectives do, however, often in practice tend to become independent aims in themselves. The fulfilment of these aims will often be a positive thing, but it is important to see the sub-objectives as means in the strategy for the general sustainable rural development. This aspect has also been strongly advocated by Chambers [15]. Because focusing on a single aspect may lead to results that actually counteract a general development, for example can increased agricultural productivity be achieved both by supporting a few large scale commercial farmers and by general programmes for the many small scale farmers or other broader actions, but only if the benefits are controlled by the actual target groups will the results contribute to the general development aims. This focus on the general principles inevitably leads to recognition of the fact that project activities must be planned and analysed as parts of an integrated (although the word seems to

have become a fashionable phrase) set of activities, and both direct, indirect and the various derived effects should be studied carefully in the analysis. In some parts of the analysis the individual activities of the integrated action may be studied separately, but it is essential that the total programme is the final level of evaluation, because the activities will usually interact so that the total effects will not be merely a sum of the results of the individual activities.

Another important aspect in the analysis is the basic problem analysis. In relation to the described principles the ideal statement is - "what they want and need", which leads to the seemingly obvious fact that it is the "real" problems that should be attacked. The analysis and understanding of, what the "real" problems are, is, however, not a simple task. What from an urban based planner's or a more general national point of view is regarded as a problem might not be perceived as such by the poor rural inhabitant. From the energy context an example of this conflict could be the attempt to develop and introduce new wood-burning stoves in the rural environment. Many projects and programmes of this type have failed (see ref. [40]). There are as already mentioned usually several reasons for project failures, but one of them is often that projects of this type have been based on overall environmental or biomass conservation considerations, while aspects of this kind were not experienced as a problem by the direct users - the rural women. In a situation where daily survival is the actual problem, it is understandable that long term considerations about environmental degradation do not have high priority. But in areas where wood supply has become a recognized daily problem, the same type of action may be very successful, if it is appropriately adapted to local traditions and social structures.
Some of the other reasons for failures in this specific context could be lack of analysis of factors such as the influence of gender relations, the problems attached to the mechanisms of technological change in a society, the lack of investment possibilities in a society dominated by subsistence farming, the user's preferences with regard to design and operation, etc.

All these aspects are naturally important in relation to preparation, design and analysis of this type of rural development project. On this general level it has not been possible to consider in detail the individual reasons although their importance is recognized. More detailed discussion must be found in other studies such as Cecelski [12] on the impact of gender relations on rural problems.
The aspects around technological change, innovation and transfer in connection with development have been dealt with in numerous studies. For a comprehensive presentation of a conceptual framework reference can be made to Müller [49], and an elaboration on this framework by Møller [52]. More general discussion about technology and development issues can be found in Stewart [67] and Vidal [71] just to mention a few of the long list of authors that have been working with this subject.

5.3. General guidelines for the analysis

When this very short and general discussion of rural development is summarized, the main aspects that seem to be important for a positive result, and therefore ought to be included in the analysis of proposed activities, may be expressed in the following guidelines

- analyse and focus on the overall aims of rural development, use only sub-objectives as means to achieve the general aims.

- plan activities as part of an integrated action instead of a partial approach, where the activities are analysed, prepared and selected on their individual account.

- analyse the structures of the local community, its relations to the surrounding society, its history and traditions, and the factors that are underlying and have caused the present situation.

- use a bottom-up approach based on people's own needs and their perception of the problems (participatory approach).

- identify and include in the analysis both the direct, indirect and derived effects on the target group and on the other parts of the local community.

- identify and analyse political, social, resource and other possible constraints on the planned activities.

The individual analysis tasks in these guidelines are rather idealistic and although additional tasks could easily be added, it is not realistic to expect practical planning situations, where even the aspects already listed can be covered in a comprehensive way, at least if the analysis has to be performed by one or more sector level planning institutions without external assistance.
The dimensions of the analysis work must naturally be in accordance with both the size and impact of the studied activities and the available resources for the analysis work, just as it has been discussed in the previous chapter in relation to the critique of the internationally imposed demands on the local analysis work in the developing countries.
At the risk of adding to these demands, it is suggested that a limited analysis of the most important aspects should be a basic part of the early preparatory work of all projects aiming at rural development. If following the suggestion means that other parts of the analysis work have to be reduced, it is naturally a problem, but in the light of the previously described importance of the early planning phases and the decisions made at this stage, it is considered important that the suggested aspects are given a high priority. In practice a compromise solution has to be found, as suggested in the description of suggested planning model for the DOE in Zambia, where drastic changes cannot be implemented independent of the relations to and the demands from other national and international organisations.

In relation to activities where the integrated approach results in cooperation across traditional sector borders, it might be possible to combine the administrative resources of the various

sector institutions and be able to perform even the more comprehensive analysis. This naturally demands flexibility and openness of the involved institutions and represent a break with the existing rigid administrative structures.

Finally, it is important to underline that the described tasks in the guidelines are all oriented towards the early phases of project identification and mainly of a qualitative nature. This seems also to be in accordance with the previously discussed importance of the identification and preparation phases, and the many decisions and selections that are performed at these stages. The function of the guidelines should therefore be to put increased emphasis on the analysis work in these phases and generally on the qualitative aspects.

6. ASSESSMENT OF THE ACTUAL PLANNING SITUATION

6.1. The need for a specific approach

The importance of the specific setting of the project planning and -analysis activities has been emphasized several times in the discussion and critique of both the project cycle approach and the traditional analysis methods. The idea of some universally applicable procedures is not found to be sustainable, but the described general methods can naturally be a part of the actual specific approach. Both because they might contribute to make the approach more comprehensive, but also due to the fact that these methods are currently being used extensively, especially by the donor organisations, and this situation imposes a need for inclusion of this type of analysis in the planned approach for a sector institution in a developing country.

This external influence is already the first example of one aspect that has to be considered in the specific context.

There are a number of other important factors that have to be given attention.

The purpose of this chapter is therefore to introduce and discuss the important factors that, in their interaction, form the specific setting in which project planning and analysis is taking place. In the next chapter the planning tool developed for this specific setting will be described.

The essential factors that will be considered can be summarized by the following general headings:

- political and social setting
- administrative structures and traditions
- available resources and qualifications for the analysis
- type and purpose of the projects to be analyzed
- aim of the analysis itself and methodological tradition.

Many of these aspects have been described in a broader context in the previous reports [21], [22], and the focus here will therefore be on, how the specific planning situation in the Department of Energy (DOE) in Zambia is affected by these factors.

6.2. Political and administrative conditions

In order to avoid repeating earlier descriptions, the introduction to the Zambian society will be concentrated on highlighting a few aspects that have direct bearing on the planning conditions.

- The political system is based on a "one-party participatory democracy" with a strong centralization of power in the President, who is leader of both party and government.

- The official political ideology is called "humanism" and is based on nationalistic and socialistic ideas about the society, but also influenced by both capitalistic and traditional African ideas and values.

In relation to development, the strategy in "humanism" is close to the Basic Needs approach, with parts from both the BMN and the BHN directions (see section 4.4).

- The production form in the industry and mining sectors is basically capitalistic with direct state participation, while the service and agricultural sectors are dominated by informal and subsistence production forms.

- The influence of the party and the government on developments in society is potentially quite large, both through the state institutions and the large number of parastatal corporations. But the structure of the state to a large extent still reflects the structures of the colonial administration and decentralization of planning and administration, although given a high priority in principle, is only happening slowly. This means that the adminstration is very centralized and incapable of control and regulation at the general level, while the structure is often too weak to perform and be in charge of detailed development programmes. Recruitment, especially of professionals with university degrees, is a general problem and a result both of insufficient capacity in the education system, and a public employment system with salaries that are very low compared to the private sector. The result is that most state institutions are understaffed in relation to their tasks, and there are generally very weak administrative structures, especially at regional and district level.

- The national planning system is principally established as a top-down procedure with centrally performed macro-level planning on a 5 year basis. However, due to the rapidly deteriorating economy and the general causes described in chapter two, the system has not been functioning for a number of years. The last five-year plan was published in 1979, the following one was prepared but never launched. In the plan from 1979 the development aims are expressed in 11 principal objectives each containing a number of sub-objectives; in a concise formulation these objectives are

- to use planning for attaining socialism which implies the recognition of the rightful place of both domestic and foreign private sector side by side with the public sector, the priority of which should be assured, the balanced development of linkages between industry, agriculture and other sectors of the economy, and the harmony between production and consumption;
- to promote employment by means of labour-intensive technology;
- to diversify the economic structure by strengthening agriculture and industry and by reducing dependence on copper;
- to give highest priority to rural development with emphasis on high agricultural production for self-sufficiency and exports; to promote small-scale industrialization. In order to fulfil the above, village regrouping schemes will be reapplied, rural reconstruction centres, state farms and school production units will be further developed and credit, marketing and extension facilities will be created;
- to promote industrial production for import substitution and exports;
- to promote prospecting and exploitation of non-copper minerals;
- to reduce the disparities in the levels of income between the rural and urban sectors through the adoption of appropriate investment, fiscal and income policies;
- to promote regional pattern development;
- to speed up the process of Zambianization;
- to expand education and training facilities; and
- to attain progressively a target growth of 6 per cent of GDP in 1983 under conditions of reasonable price stability. The average growth rate would be 4.8 per cent at constant prices.

(Kartona, 1982)

These objectives can only be characterized as very general and certainly non-operational as a basis for planning on a more

detailed level. They are naturally a result of a compromise between the interests of the different groupings in the society and since no ranking or detailed targets except for the economic growth are included, it will in practice be possible to ligitimize almost any kind af activity by referring to these broad objectives. If the actual results obtained after the expiry of the planning period are compared with the ambitious objectives, the general conclusion would be that only very limited results have been reached. The lack of detail in the formulation of the aims do, however, mean that it is very difficult to make an evaluation.

The social and physical structures of Zambian society are naturally also important factors, but only a limited number of the relevant characteristics will be mentioned here

- high level of urbanization, more than 45 per cent of the population live in urban areas and through both general population growth and continued rural-to-urban migration the total number and the share increase rapidly
- the population density in the rural areas is generally very low and subsistence agriculture is the totally dominant production form
- the infrastructure is highly oriented towards the urban centres, the copper mining area, the large enterprises and the commercial farming areas
- only a minority (20 per cent) of the adult population has formal employment, while the situation for the large majority is a mixture of unemployment, subsistence production, seasonal wage work and informally organized activities
- there are two parallel power structures, the traditional based on the relations between and within the large number of different tribal communities, and the political and economic based on positions within party, government, administration and private or corporate enterprise. The two structures are interrelated in a number of ways, but it is essential to be aware of both structures.

The national economic situation with regard to both the balance of payment and state finances is very poor and has been declining for the last decade mainly due to falling international prices of the totally dominant export commodity - copper. Due to this importance of the mining sector, development activities have traditionally been focused on creating good conditions for this production and many of the activities aiming at diversification and agricultural development in the rural areas have been neglected. In the present situation where the need for change is more recognized, the possibilities for initiating new activities are restricted by the declining economy. The Zambian government is therefore highly dependent on external funding either through loans or some kind of development assistance.

The aspects outlined above together describe a situation, where the basic conditions for the detailed planning at sector level are established as a compromise between political ideology and general objectives on the one hand and limitations of the political system, the existing social and power structures, the planning traditions and the economic situation on the other.

At the sector level these conditions form the general background, but the specific sector structure and responsibilities naturally also affect how the specific administrative set-up has been organized both formally and informally. Before the set-up is described the sector structure will therefore be briefly outlined.

The energy sector in Zambia is divided into two different categories according to type of energy source:

- the commercial sources (oil products, coal, and electricity) where the supply side is organized into large parastatal corporations and the infrastructure established after the general principle described earlier where supply is oriented towards the mines, the industries and commercial farms and the wealthier parts of the urban areas.

- the wood-based sources that are the totally dominant energy source for people in the rural areas and the poorer parts of the cities. Supply is either secured by individual collection (fuelwood) or through informally organized supply to the local markets (charcoal).

There is naturally a transition area where both types of sources are used, but since the choice of source is strongly related to income, the demarcation lines are generally quite clear. The importance of the woodfuel sources is gradually being recognized at political and administrative levels, but the organisation of the sector is still strongly oriented towards the supply of the commercial sources.

The organisational set-up has changed significantly in the eighties through the formation of specific units for coordination of sector activities. Earlier the parastatals responsible for each their own part of respectively production, supply and sale were to a large extent uncoordinated apart from control by the general parastatal holding company. The formation of the National Energy Council (NEC) as an advisory body to the government on energy policy issues was the first step towards recognition of energy as a coherent planning area. When the Department of Energy was created in 1982 within the Ministry of Power, Transport and Communications it was and still is the only government institution with responsibility for energy planning and project preparation.
This role has been difficult to achieve, both with regard to the commercial and the woodfuel sources. The existing powerful parastatal corporations responsible for commercial supply are generally not interested in supporting an institution in a direction, where it could have strong influence on their activities unless some direct benefits could be obtained for instance through better donor contacts. The situation surrounding woodfuel is somewhat opposite, partly because the recognition of the problem at the policy level is new, and also because the problem is complex in the way that it is occurring as a result of many different interacting factors, and the energy aspects are only one part.

As a result of both types of difficulties the role of the DOE has largely been to coordinate the development in the sector and to initiate and prepare activities for funding from either government sources or foreign donor and financing organisations. The sector objectives that have been established as a basis for the DOE's work are:

- to ensure that domestically produced energy is supplied to as many users as possible
- to minimize costs of energy, particularly imported energy products
- to conserve energy, particularly oil
- to substitute domestically produced electricity for imported oil
- to ensure that energy resource allocation yields greater social and economic benefits
- to exploit opportunities for exchange of energy with other countries
- to improve the supply of energy for rural and urban households and for rural development
- to minimize environmental damage of energy production and consumption.

The objectives generally reflect the fact that commercial supply is regarded as the most important aspect due to its both direct and indirect importance for the national economy. The concern about the supply of energy for urban households and rural areas is fairly recent, and the activity is still quite limited but growing.

The objectives for DOE's work mainly state broad intentions, with no direct targets to be reached, which is probably realistic in the present economic situation. Only a limited number of activities can be performed within government budgets, and one of the tasks of the DOE is therefore, in addition to the possible activities, to identify and prepare projects for presentation to prospective foreign funding agencies.

The general political ambition was that the initiation of government programmes and the identification of projects should emerge

as a result of the macro-level planning efforts, but as it was described in chapter two, this process is not functioning in practice.
Project ideas may therefore emerge from different types of sources like politicians, parastatals and private companies, research institutions, foreign sources like the large development institutions and their country and sector studies.
Finally, ideas can naturally be a direct result of the planning activities in a government agency like the DOE.
In relation to the phases of the project cycle, which is also largely the basis for project procedures in Zambia, it is then formally the task of the involved sector institution to perform the preparation activities, while the selection, and in donor-funded projects also the negotiation, is principally the responsibility of a central institution - the National Commission for Development Planning (NCDP).
In practice the procedures are, however, different with regard to some of the central aspects.
Contacts of an informal character are usually established between the sector institution and a potential donor at a very early stage, the idea may even come from the donor. This contact will inevitably lead to a situation where the preparation and analysis work will focus on the proposals with an interested donor in order not to "waste" the limited administrative resources on proposals that cannot obtain any funding. In many cases the limitations on both manpower and economic resources in the sector institution lead to a situation where parts of the preparation and analysis are taken over by the donor through financing of pre-feasibility and feasibility studies performed by external consultants based on guidelines established mainly by the donor.
The final proposal will be presented by the sector unit to the NCDP, but it will be based on the results of the external studies, perhaps supplemented with some adjustments and recommendations. The principal task of the NCDP is then to analyse the submitted proposals from the sector level and select the ones that make the best contribution to the national development objectives. In practice this analysis will, however, not be per-

formed. If the proposal has already got a potential donor, the function of the NCDP will only be to secure formalities about the inclusion in the agreement between the two countries. In the rare situation where a proposal is presented without donor contacts, the principal role of the NCDP will be to find the necessary funding, and a real analysis and ranking of projects prepared by the sector units will usually not be performed.

The project planning situation seen from the DOE point of view therefore consists of three levels:

- sector level/DOE
- national level/NCDP
- donor level.

As described before donor influence on what activities are actually performed is very significant, especially due to the early involvement in the preparation phase. The selection criteria will therefore commonly be those of the donor, and although it usually is possible to obtain accordance with the very broad national and sector objectives, the selections will not be able to make up the basis for a coherent plan of action for the sector. If this is the ambition, increased local influence will be necessary in the identification and preparation phases, and that inevitably has to be at the sector level, because a stronger central institution cannot be expected to obtain the crucial influence on the early selections, and seen from the point of view of the sector institution, more central control will naturally also be undesirable.

Expectations about a more active role for the DOE and more national influence on the whole project planning process is in fact part of the background for the aim of finding more appropriate projects analysis methods in this study.

The main purpose of this introduction to, the energy sector and the planning procedures in Zambia has been to provide a general understanding of the social and political framework that con-

stitutes the external conditions on the specific planning situation.
The next section starts out with this framework and then seeks to identify the conditions that are rooted in the existing internal situation of the DOE.

6.3. The specific analysis conditions

The organisation and activities of the Department of Energy (DOE) have been described in detail in the previous report [22] and will therefore not be repeated here. Instead the present and expected future project analysis tasks will be discussed along with an assessment of how these tasks are performed. The restrictions that are imposed on the analysis by the available economic and staff resources will also be examined.

Due to the fact that the DOE is a new institution, it is still in a phase where the areas of responsibility are gradually being established, because there was no clear political definition from the beginning. As already mentioned the chosen course has been to establish the basic energy production and consumption statistics and to coordinate the activities where government or foreign funding are involved. In relation to direct planning the activities are limited by the responsibilities of the existing organisations, especially the parastatals responsible for production and supply of commercial energy.
Projects planned and prepared by these organisations may be presented to the MPTC and the DOE if funding outside the ordinary budgets either from government or foreign donors, is necessary. There are, however, neither formal rules nor practical possibilities for any analysis of the proposals. The project oriented activities in the DOE therefore aim at areas that are either outside the normal activities of the other organisatisons or complementary to these.
The areas that until now have been given special attention are:

- conservation and substitution of imported energy sources in the industrial sector
- conservation and substitution of charcoal in relation to urban household consumption
- assessment of the role of various energy technologies in relation to integrated rural development efforts.

In addition to these internally selected areas, the DOE is also responsible for the Rural Electrification programme, the aim of which is the electrification of all district centres and other major rural townships and larger development schemes, especially commercial farming projects. The selection of the new sites for electrification or existing sites for rehabilitation are to a large extent determined by two aspects, direct political priorities and the possibilities of finding an interested foreign donor for the project.
The detailed technical aspects are determined directly by the electricity company ZESCO, so the role of the DOE is mainly to administer the programme, establish contact with potential donors and usually also to make an economic analysis of the proposal in order to try to find as cost-effective solutions as possible. It is, however, generally on a very limited scale that this analysis is performed, because information, especially on the consumer effects, is very limited, and there are neither economic nor manpower resources for performing any in-depth studies of the actual local situation. The methods used in the economic analysis are the simplest possible traditional Cost-Benefit Analysis including only the direct cost and benefits at social prices (no duty and customs), or instead a direct financial analysis for the production company. (The difference between the two is usually only duty, tax and customs in these simple versions.) The traditional calculation criteria, Net Present Value and Internal Rate of Return, are used together. This level of analysis will normally also be applied in the situations where the DOE is asked to review and comment on other externally formulated projects.

The internal priority areas aiming at urban households and rural

areas in general are the first attempt in Zambia to try to co-ordinate this type of activity. As with the commercial sources, the supply aspects (wood) are officially controlled by other institutions. The difference in practice is significant, however, because these institutions are other government depar - tments with very broadly defined areas of responsibility like forestry or lands and natural resources, and they have traditionally not devoted any special interest to the supply of wood for energy purposes. There is, however, a growing awareness also in these organisations of the woodfuel aspects, and also an interest in participating in planning and preparation of more integrated action.

As part of the preparatory work for the Fourth National Development Plan, which has never been launched due to the general economic situation, the section responsible for this area in the DOE succeeded in gathering the relevant institutions in two work groups, with the DOE staff as coordinators and secretariat. Due to the general lack of previous experience, the first set of proposals that were presented late 1985 consisted mainly of studies, pilot-projects, etc. with the central aim of improving the knowledge of the actual problems and the possible relevant actions. After this phase it was naturally the aim to prepare more substantial projects.

At the time when this set of proposals was formulated and prepared, there were two Zambian professionals and a foreign adviser working in the section, and expansion was being planned. The plans for the future role of the section were naturally quite optimistic and were directed towards achieving a role as catalyst for projects with energy as an integral part of the general rural and sub-urban development process. This role would also imply a need for increased project analysis activities, especially concerning initiation and preparation of proposals in collaboration with other government agencies either at the central or a more local level. These expectations were actually an important part of the background for the aims of this study, as will be discussed further in the next chapter.

The actual development of the section and its work has, however,

been quite different from expectations, and is a good example of both the limitations on planning and analysis from available staff resources and the vulnerability of a new and small organisation like the DOE.
One of the Zambian professionals left the DOE soon after the presentation of the first set of proposals for a job in a parastatal company, where employment terms are much more attractive than in the government institutions. These conditions included in this case that a house was at his disposal from the start of employment while the government employee often would have to wait several years, and a considerably higher salary. The con-contract of the foreign adviser expired, and it was not possible to obtain funding for a replacement. Finally, the second Zambian in the section received a scholarship for postgraduate education abroad and went on leave for one year.
In less than a year the situation had changed from a high level of activity and a central coordinative role to a situation where activities were postponed, abandoned or maintained at a very low level of activity by staff in other sections of the DOE.

While this report is being written there seem to be significant changes once more. The Zambian who had been on leave has returned, and there is also increased external interest in the area both within Zambia and from many of the foreign donors, where especially the awareness about the environmental aspects of fuelwood consumption is growing. It is, however, still too early to comment on the perspectives for the future role of the DOE in this area.

Because the DOE has not yet reached the situation where projects actually have to be analysed, it is naturally not possible to consider any existing methods for analysis of woodfuel and more general rural-oriented activities. The impression gained from several discussions, however, is that there would be a need for a broad set of criteria for the analysis. In addition the social acceptability was given high priority. Both economic costs and fuel efficiency were also seen as highly ranked objectives, but not always as straightforward criteria, because there are sev-

eral social and financial limitations, for example on the investment possibilities of low income groups.

Whether it would have been, or in the present situation of renewed activities will be, possible to perform the necessary analysis work in order to pursue the broader set of criteria is a question that it is difficult to answer. With the more or less permanent shortage of professional Zambian staff with university education and the extremely scarce economic resources for equipment, data collection, field studies, etc. the possibilities do not seem to be good. In more limited selected areas or with increased external support there might be basis for an active role.

The other main DOE activity on energy conservation and substitution in the industrial sector has not been studied in detail in this project. It seems, however, that the activity is progressing with the responsible section in the DOE in a initiating role, where energy saving measures are being identified and prepared together with the involved industries and the possibility for foreign assistance to the activities is being investigated and promoted. The success in this activity has primarily been due to the efforts of one very able Zambian engineer and support from United Nations Development Programme (UNDP). Analysis work will typically be straightforward financial calculations for the concerned company and the benefits for the society will occur through less import or more cost-effective production, but the projects are not on a scale where these aspects need quantification.

When the project related tasks of the DOE are examined as a whole, the dominant impression is that only very limited direct analysis is presently performed within the institution. The main activities are centered around coordination and promotion of projects and proposals coming either from other Zambian energy sector institutions or expressed through the ideas and priorities of interested foreign donors and companies. There are, however, some limited but important areas where a more active role is pursued, but the existing limitation on both pro-

fessional Zambian staff and the economic resources for active field studies, data collection and other necessary tasks together constitute very serious restrictions on the possibilities for achieving this role. The expressed expectations of a more active role of the DOE with increased influence on the whole project planning process in at least parts of the energy sector may therefore not be realized for some time yet, but the principal desirability of this direction of development for the institution will still be maintained here and the above mentioned very recent developments do point in this direction.
The existing project analysis work that is being performed is generally limited to fairly simple financial profitability or economic cost-benefit calculations performed on a pocket calculator.
For the general planning and energy statistics work the DOE has two personal computers supplied through foreign donor grants. Various standard software and a spread-sheet programme are also at disposal, but until recently the main use of these facilities was for storage and limited statistical presentation of the data on commercial supply and consumption and for general word processing tasks. This rather limited use was extended, when the so-called LEAP (Less developed countries Energy Alternatives Planning system) [28] model was installed and training programmes were undertaken. Although this rather elaborate biomass oriented planning model is still only of limited use mainly due to lack of the appropriate data, the introduction of the model has increased the general familiarity with computer work among the Zambian professionals.

It has not been possible in this presentation to cover all the described factors that were considered essential for the specific setting. Two aspects have deliberately been almost totally neglected. Firstly the purpose and type of the projects to be analysed have not been described in detail, since there are so few examples of actual projects in the DOE. Secondly the assessment of the available qualifications for the analysis has not been performed, as this would become very personal in relation to the staff.

Some general principles have, however, been identified for attacking the different problems concerning the supply and use of energy in urban households and rural areas in general. These planning options have been described in detail in the previous reports [21], [22], and only the headings will be listed here to give an impression of the types of activities and considerations that are regarded as relevant.
In relations to urban households the options are:

- enhancement of the efficiency of both production and utilization of charcoal
- afforestation designed for the specific problems
- substitution of wood-based fuels with other fuels.

The relevant options in relation to rural energy are regarded in a broader context of how energy can contribute to more integrated development, and they can better be characterized as principles for the planning process than for the actual actions

- to be aware of the possible impact of a planned project on the existing consumption and supply structures
- to plan for the energy aspects of any rural development project and ensure that it is both economical and environmentally adequate
- to identify areas or specific tasks where development of new energy supply and utilization techniques can contribute directly to the rural development process.

These very general principles illustrate two important points. Firstly, that energy development cannot be isolated from other development activities. For instance the Zambezi study [21] illustrated that the rural electrification programme will not in itself create any general development. Secondly, the principles also show that knowledge of both the general and the specific energy situation in rural areas is very insufficient.

7. PRESENTATION OF A NEW PRACTICAL APPROACH TO PROJECT ANALYSIS

7.1. Introduction

The approach to project analysis presented in this chapter is in many ways the result of a compromise between on the one hand, the desire to promote an alternative and more qualitative attitude to project analysis and selection especially in relation to rural development projects, where the traditional quantitative and economy oriented methods are of limited relevance, as already discussed in chapter 4 and 5. On the other hand there is the realisation of the need for a specific approach specially designed for the individual planning conditions and resources and based on knowledge about the actual energy and development problems and possible project types. These specific planning conditions for the Department of Energy in Zambia were assessed in the previous chapter. This assessment does not result in a defined need for a new approach to project analysis in the present situation. It would for example be much more relevant to increase both the staff and the economic resources, because these are the most important factors in constraining the project preparation and analysis work. Unfortunately this is not possible and suggestions for a new and more decentralized planning structure, which would be particularly appropriate in relation to the work with rural energy development, are therefore not realistic. The aim of developing a tool for some of the analysis work is therefore mainly seen as a small step that might help to utilize the present administrative resources better and for more comprehensive work in the future. In the final concluding chapter the possibilities of fulfilling this aim will be discussed as part of the evaluation of the study in general.

The guidelines for the developed approach were established in the period when the DOE's activities in urban household and rural energy development were peaking, and the perspectives for

the future role as coordinator of the activities in this area were most optimistic. The description of the internal conditions of the DOE showed that the actual development has been quite different from what was anticipated. It has naturally not been possible to change the suggested approach at the same speed as the changes in the specific conditions. In order to cope with this kind of changes, however, the aim from the start has been to give high priority to flexibility and modularity in the approach, because this should facilitate use at different ambition levels. A direct transfer of the developed approach to similar planning institutions in other developing countries is naturally not possible due to the specific design. The high priority to flexibility and modularity means that the necessary changes and developments can be performed fairly easily given sufficient knowledge about the new situation.

These structural considerations are in fact the first reflections related to choice of methodology.
The next section will describe other of the basic considerations that have lead to the specific approach.

7.2. Methodological considerations

When the planning situtation in the Department of Energy (DOE) is assessed in relation to the project cycle, there is, at least in principle, some accordance. The identification, preparation and design phases are sector level tasks, but as the presentation of the planning situation showed, they are not to any significant extent performed within the DOE. The appraisal is solely a task performed by the donor and the negotiation and approval is a formal matter between the donor and the central-NCDP level.
The project cycle is therefore a fairly good presentation of the formal procedures in Zambia for projects where external donors are involved, and the reason for this accordance is partly the influence and demands of the donor organisations and partly the political interest in a centralized planning structure.

The appraisal and negotiation phases will also in practice be carried out as described, except for the important fact that the actual selection has been performed even before the appraisal, although changes within the selected project may occur in theses phases.
The structure of the activities at the sector level is, however, in practice not appropriately described by the three first phases of the project cycle.
All the described tasks might be present, but the process from idea or aim to the selected proposal for possible donor appraisal can more rightly be seen as two qualitatively different phases that schematically are shown in Fig. 7.1.

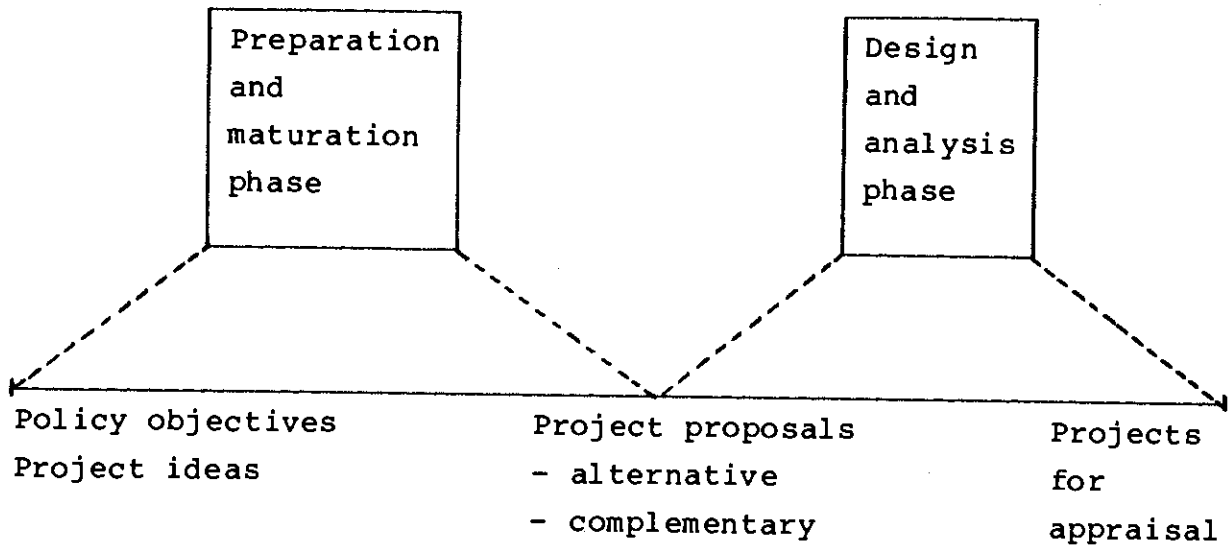

Fig. 7.1. Project analysis process at sector level

The figure is not an illustration of the work currently being performed by the DOE, but rather an idealized picture of the work that the different involved institutions jointly perform. It can also be regarded as the process that a single project passes through from the emergence of the idea until it ends up as a comprehensive proposal.

The present role of the DOE can best be described as a coordination function for most projects in each of the three "check-

points", while the work in the two analytical phases is either performed by other Zambian institutions, typically the parastatal companies, or external donors through missions and studies, or alternatively no work is performed at all.

Within the described areas, where the DOE seeks to obtain a more active role, it will potentially be possible to actually perform or closely control all the activities in the planning process. The ambition in the work with the new planning tool has therefore been to aim at both phases and not just at the traditional analysis or assessment work. The purpose of each phase and the qualitative differences will therefore be elaborated in the following.

The starting point may vary considerably when all project activities passing through the DOE are considered, but if the discussion is focused on the rural and urban household energy activities, the process generally starts of with either a specific problem or a specific technology, and the procedures are then generally to try to find a technical solution to the problem or a problem where the specific technology can be applied. The ideas and proposals for these activities are commonly generated at the sector level or based on suggestions from some external source. With the very general objectives at both national and sector level, it is not very difficult to relate most ideas to one or more of the broad aims, and the distance from idea to proposal is often very short especially if some potential funding sources have been identified. This means that what is here called the preparation and maturation phase are largely neglected.
If the presented ideas and the performed selections are results of direct political and donor influence or other consciously formulated demands, then the process will probably not be any different if a qualitative analysis is included. But a number of the selections performed between idea and proposal are not based on any explicit background. They are commonly the result of more general considerations based on experience, "common sense" and implicit ideas or assumptions about the concerned area. Other

possibilities for action may simply be omitted by lack of reflection on these alternatives.
It is mainly in order to qualify the last type of decision and choice that the importance of the preparation phase is emphasized. The aspects that could be relevant to include can to a large extent be based on the guidelines established in the discussion about rural development, and when these broad guidelines are specified in relation to this phase some of the relevant tasks would be:

- problem group analysis
- target group analysis
- identification of possible actions
- assessment of effects (direct and indirect)
- study of the impact on other groups and society
- estimation of resource use, environmental impact, etc.

These are obviously complex tasks and basically of a qualitative nature. If they are going to be analyzed in practice as a part of the DOE's activities in relation to rural energy development, it will be necessary, as discussed in the general chapter on rural development, to join forces with other institutions, preferably with a more decentralized structure such as the Forestry Department. If that is not feasible, a more limited analysis, even as a desk study where the listed aspects are considered systematically, will be better than the existing situation and at least lead to more conscious selection of the proposals, and help to qualify the discussions with prospective donors.
To illustrate the importance of these qualitative analysis tasks, the example about woodstove programs can be used again.

> "In many of the early cookstove programs, little or no effort was made to examine the needs and preferences of the stove users. Without their feedback, designers failed to transfer certain valued functions of traditional stoves to the new models.
> The assumption that fuel economy is a top priority for stove users is no longer considered valid - especially

as regards rural users. Many of the earlier cookstove programs also failed to define their target groups. For instance, dissemination programs and training courses often focused on men even though women are the principal users." (Krugman, 1988)

The quoted experiences point directly to a lack of adequate analysis of some of the aspects that are suggested for this preparation phase, like problem and target group analysis, assessment of effects, etc. It is also mentioned that the programmes have often been based on wrong implicit assumptions about priorities, which also illustrates the type of choice that should be improved through an analysis of the qualitative aspects.

One section of the developed approach is therefore oriented directly at the work in this phase. Due to the qualitative nature of the analysis, the ambition with this section is mainly to provide a systematic framework for the task and to stimulate and ease this type of consideration. With the limited resources for the analysis in the DOE, the section is structured as an outline for a report, and the relevant chapters and forms can be selected individually in relation to what is considered necessary in the specific case. If more comprehensive work should become possible in the future, new aspects can be added and the existing expanded.

The results of this phase are ideally seen as one or more proposals, where the objectives for the activity have been specified along with other essential parameters and conditions. The ambition in the design and analysis phase is then to secure that the objectives are met in the "best" way, and if there is a need for ranking of more proposals then to establish the necessary criteria. The criteria used for finding the "best" way and for ranking will generally be the same. In the suggested approach there is, however, no weighting of the criteria against each other. The analyst or decision maker can choose to apply different value-principles in different projects according to the

importance that is attached to the criteria in the specific context. If a more consistent ranking is desired the same weights must be applied to the same effects in the different proposals.

The most common situation will, however, in practice be to test the general soundness of a single proposal possibly with special interest in the sensitivity of some of the key parameters. This situation resembles the donor appraisal, and some accordance between the two levels of analysis with regard to the criteria used will be expedient in order to meet the demands from the donors for specific types of analysis and to be able to enter a qualified discussion about the later appraisal.
This wish or demand for accordance is one of the reasons for establishing a specific section for analysis of the economic and financial aspects. But an evaluation of the proposal on criteria of this type will generally also be regarded as important from a national point of view. It is, however, important to emphasize in relation to the earlier discussion and critique of economic analysis methods that the criteria here are not used as a general welfare measure, but as one aspect evaluated independently of the other criteria. The aim is therefore only to include the direct measurable costs and benefits and generally use direct market prices (in the economic analysis corrected for tax, customs, etc.).

Other aspects that are considered important may then be evaluated separately, and in this context where the main aim with the approach has been to focus on the aspects related to especially woodfuel consumption and supply, it has been found relevant to look at the impact of the analyzed activities on the wood resource situation as a separate criterion. Finally, it is realized that the wood aspects can not be seen independently of the other energy sources, because one of the possible actions for instance in urban and sub-urban areas is to substitute some of the woodfuel with other sources. Therefore a general evaluation of the energy effects of the proposal measured in comparable terms has been included as the last criterion in the present version of the approach.

This does not, however, mean that other criteria are not important, and with the modular structure and the independent analysis of each criterion, it will be easy to supplement with additional criteria. For instance, if more general environmental consequences were considered interesting a separate section could be devoted to this type of analysis.

The advantages of the modular structure with the different sections and the parallel criteria are therefore clearly the flexibility, the possibility of partial analysis of one or a few aspects and the fact that the main value judgements are left open-ended for the decision makers, who will then have to use clear political priorities in the weighing of the different criteria. This last aspect may also be regarded by many decision makers as a disadvantage because it can be difficult to establish the clear political priorities, and there is often a desire on the part of the political decision makers for single criteria results like in the cost-benefit analysis. The point here is that "hiding" the value judgement in the analysis as in CBA does not change the need for political priorities, it only makes them less visible, and the aim of the suggested approach is to make the planning process as transparent as possible.

In relation to the described situation in practice, the need for selections after the analysis will be very limited, because the number of proposals that reach the design and analysis stage will generally be clearly related to the funding possibilities. The main selections are, as emphasized several times, performed in the phase between idea and proposal.

Finally, it may be added that although the two described phases are seen as both chronologically and qualitatively different, there will often be a need for some overlap between the two types of analysis. It may for instance be relevant at an early stage of the preparation to get a quantitative idea about how the wood-resource is affected by a planned action. Similarly it will often be relevant to review some of the qualitative aspects if two different designs for a project are analyzed in order to

see if both adequately meet the actual problem or affect the target groups in the same way. This need for overlapping analysis also indicates that a flexible analysis structure is highly desirable.

7.3. Choice of appropriate form and design

The considerations have until now been concerned with the principal content and formal structure of the analysis approach, and it has also been made clear that it should function as a tool to help the staff of the DOE in their future work.
With the potential users so clearly defined it has also been possible to include consideration about what practical form and presentation would be the best under these practical conditions. Again the result naturally has to be the best compromise between these practical conditions and the possibilities for establishing the desired methodological structure.

Especially the different quantitative analysis modules point in the direction of some type of computerized model at least for parts of the tool, while the qualitative parts are less suited for traditional computer systems and more oriented towards knowledge presentation supported by different types of figures and schemes. The question is then how to combine these two different directions in an appropriate form and still ensure the other relevant aspects like:

- transparency with no hidden assumptions
- modularity and flexibility
- simple and "user-friendly" presentation.

The idea of using a computer for at least some of the modules was based on the fact that the DOE already had one IBM personal computer when the collaboration started and received one more as part of a grant for a general planning model. The choice of hardware was therefore straightforward and with the general tendency towards compatibility among PC's, this did not impose any limitations on the possible wider applications at a later stage.

The next decision was then to find a software type where it would be possible to meet both the structural, methodological and user oriented conditions. Furthermore the interaction between the quantitative and the qualitative modules had to be considered. Various possible solutions were discussed like for instance using traditional computer languages like FORTRAN or PASCAL for the quantitative modules and then printed forms and checklists for the qualitative parts. This was rejected mainly because this type of programme is best suited for tasks with emphasis on calculations and less on input/output design and the possibilities for interactive use, and that is almost the opposite of what was needed, because the calculations were simple and user interactions were given high priority. These demands could be fulfilled in some of the recently developed expert-system oriented software types like LISP and PROLOG, but at the time where the development work started, this software was not fully developed for this type of small computer, and the expert system structure was not appropriate considering the demand for transparency of the decision structure and the assumptions. Even if the possibilities for easy interaction between user and system were an important feature.

One very important factor behind the actual selection of software was the existing use of the computer in the DOE. The main use was centred around two tasks. The creation of a small statistical database and general word processing facility. For both purposes the same type of software was used - one of the integrated software systems which had recently become available, where spreadsheets, database and word processing facilities were available within the same basic environment. When these facilities were compared with the established demands and conditions, the conclusion was that it would be very appropriate for the defined tasks. With the integrated word processing facility, it would also be possible to include the qualitative module. In that way the existing experience with the system was directly utilized and the generation of output forms was made directly suitable for presentation in project documents.
Several different brands of this type of software were avail-

able, and no large differences in their performance capabilities were found. The actual selection of the Framework software from Ashton Tate was mainly a matter of taste, coupled with the preference for the basic structure which supports the modularity of the proposed method.

The extremely rapid developments the last couple of years in both software applications and hardware possibilities for personal computers has not affected the validity of the choice of software for the analyis tool. On the contrary, the hardware improvements have provided additional processing speed for the calculations that in the early version were considered to be a problem. If the situation in similar energy planning institutions in other developing countries is studied, the same general tendencies can be identified towards the use of personal computers and also the same types of integrated software systems along with more specifically designed programs [28].

7.4. Introduction to the PRoject Analysis Model

The presented considerations about methodological approach, design and working environment lead to the conclusion that a computer model with a very flexible and user-friendly structure is the most appropriate form for the implementation and practical use of the developed approach to project analysis.

The resulting PRoject Analysis Model (PRAM) is introduced in this section using small illustrative examples. As already described in relation to the practical planning conditions, the development of activities in the DOE has not been as rapid as anticipated when the model development started. The ambition at that time was to use a practical case and aim at a total coherent presentation of the model. Unfortunately there is presently no relevant case and constructing a whole imaginative one is not realistic. Consequently the description here aims instead at showing the modular and flexible structure and only the main features of the different modules. The energy consump-

tion data are based on the results of the Zambezi survey [21], and the ambition has been to establish as realistic examples as possible. But as they are created for illustration of the model, and the real user situation is the opposite, where the model has to fit the project, they will not in that way be realistic representations.

The PRAM presently consists of three independent modules with no direct links between them:

- a project preparation module
- an energy and wood resource module, and
- a socio-economic module.

The desired module is operated from menues, where the user can access the desired part with single keystrokes. The individual forms have as far as possible been designed so that only the absolutely necessary data have to be entered and only the forms desired for the specific analysis need to be used. This is naturally a balance, where the desire for flexibility must not affect the possibility of performing more comprehensive types of analysis in a negative way.

All three modules are based on the same design concept. After the selection of the module the user wants to work with, the whole module is loaded, and a short introduction is shown on the screen. In the two quantitative modules the desired starting year and time intervals are selected at this stage as basis for the time series in the rest of the module. In Fig. 7.2. the introduction to the energy and wood source module is shown, and the design is the same for the two other modules.

As described in the methodological considerations the preparation and maturation phase precede the analysis phase, but it might be appropriate in some situations to include for instance some limited quantitative calculations. This interaction between the phases is not directly possible between the modules.

RESOURCE MODULE

The Resource module is designed to meet the need
for assessing the consequences of one or more projects
on the energy and wood source situation in a selected area.
The module is kept fairly simple, and all relations
between consumption, production and resource are
straightforward.
Output is automatically generated in the base case
situation, and if you do not change the below figures
projections will be made for 5 years and 10 years.

If you are interested	Base	=	1988
in other time periods	Base	+	5
just change the numbers	Base	+	10
to the desired .			

Fig. 7.2. Resource module introduction

Since the forms can be selected and printed individually, however, the user can choose the desired forms from the different modules and combine them in a project report either manually or within the general software, if the user is familiar with that.

The preparation module

The presentation here follows the ordinary structure of the project analysis process and start out with the preparation module.
The menu presented in Fig. 7.3 outlines the content of this module. The user can choose the desired form to start working in. Trained users that are familiar with the structure do not need to return to the menu for each selection, but can go directly from one form to another. The printout of the menu has been taken as a screen-dump in order to illustrate the user instructions that are not a direct part of the form.
The headings of the generally available pull-down menus of the main software are also shown. After a short training course PRAM users will be able to use these main features, and in that way get easy access to graphical presentations of data, for instance.

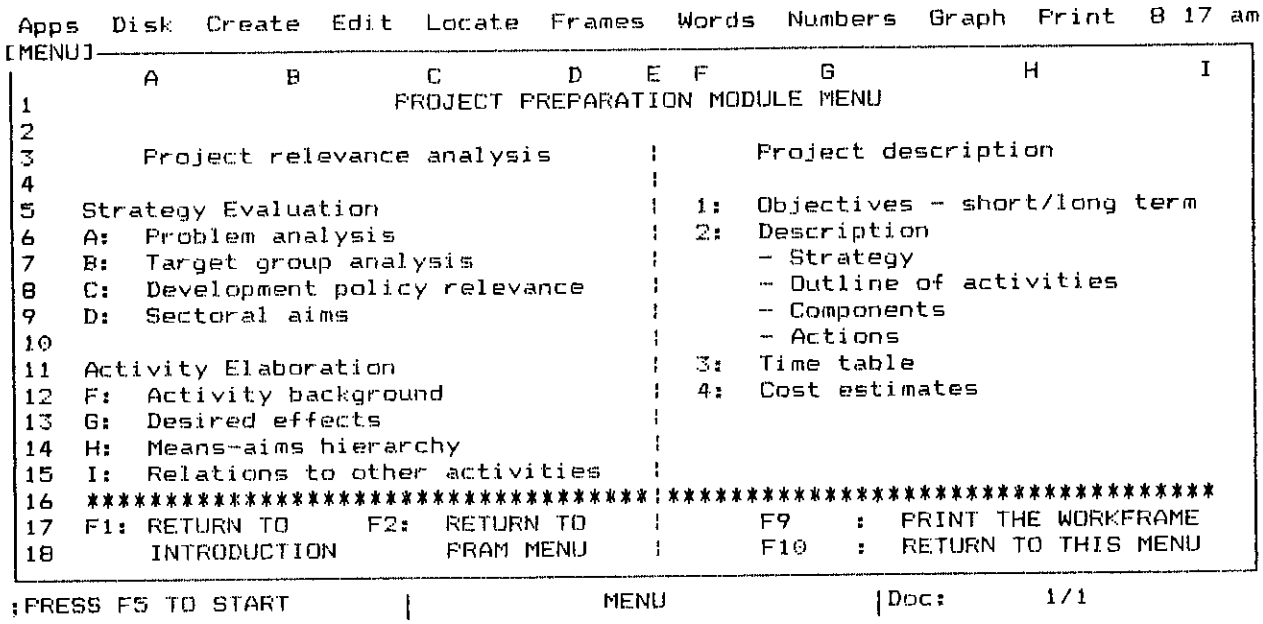

Fig. 7.3. Preparation module menu

This type of feature has therefore not been included in PRAM, but small so-called "macros" that assign a series of actions to one single keystroke could easily be designed to make graphic presentations available.

Since the aim here is merely to show the structure and the principle features, only a couple of the forms will be introduced. These forms from the preparation module can conveniently be used for a small elaboration of the two main illustrative examples

- a project where the aim is to replace old diesel engines with new ones in a rural township - based on data from an actual project, and
- a conservation project where charcoal stoves and kilns are introduced in a fictitious rural district based on the Zambezi data.

It must be emphasized that both the statement in the qualitative analysis and the figures in the quantitative are only meant for illustration purposes and should not be considered fully realistic.

In Fig. 7.4. the target group analysis is performed for the replacement project, and in Fig. 7.5. a Means/Aims hierarchy for the charcoal stove and kiln project has been established. The two forms illustrate the principles of the preparation module, where the main ambition is to stimulate the qualitative considerations for example the result of the target group analysis showing that it is only the well-off in the rural community that are expected to benefit from the analysed activity. This could indicate that it is not relevant, either from a national or donor policy point of view, but there may naturally be other reasons for promoting it. Instead of the plus/minus indications a ranking of the impact could be performed by using a numerical value. Associated with each of the cells which represent the impact indicators, there is a hidden page mainly for programs and formulas. This can, however, also be used for additional comments in relation to the entry.

The columns designed for the verbal entries can easily be expanded, but short precise descriptions are desirable and print-out options put some limitations on the size of forms consistent with well structured print.

It is evident from the figures that the user works with forms, where it is possible to enter the desired words, figures, etc. directly and see the actual design of the print out at the same time. The form itself is protected against mistakes in the entry process, but if a trained user wants to change or add new aspects the protection can easily be removed.

Since the preparation module is mainly a result of the concern that has been developed in this study for the analysis work in the early phase of the planning process, the soundness and the practical reactions to the way of stimulating systematic qualitative considerations are naturally going to be very important and interesting. As real testing has not been possible yet, it is likely that a number of the present forms have to be revised and adjusted to the practical experience. The main question, however, is whether the basic idea and the additional work it

TARGET GROUP ANALYSIS

Project name	Rural electrification (example)			Assessment of target impact											
Identified problems	Possible actions	Aimed results	Comments	High income Male	High income Female	Middle M	Middle F	Low M	Low F	Subsistence M	Subsistence F	Industry	Service	Other groups	Elaboration of impacts
High production costs of electricity	Substitute with: - efficient diesel - local hydro - grid connection	Cheaper production	Distance to both grid and hydro potential too large - no need for study		+	+	+					+	+		Cheaper supply is not expected to lead to connection of other income categories
Insufficient production capacity prevents connection of additional customers	Increase capacity or utilization of existing system	Larger capacity and new users. Better utilization of production	Existing system old and upgrading would be very difficult.												
Frequent drop-out necessitate backup capacity at the health center	Establish priority connection to h.c. New better supply. Improve system or provide emergency backup.	Minimize drop-out and no need for local backup	Only very small emergency demand battery system may be relevant to investigate, if new system impossible.												It is not possible to identify any specific target group.
High costs and drop-out lead to increase in charcoal use.	See above actions. Increase charcoal supply.	Secure that one energy source is always available.	The low number of electricity users with cookers will not affect local woodfuel market.			?	?	?	?						If rising charcoal use leads to higher prices, it could be negative for low and middle income families.

Fig. 7.4. Target group analysis

MEANS/AIMS HIERACY

Project name : Improvement of charcoal production and utilization.

Activity	Result	Direct Aim	Sector Aim	Development Goal
Organise local group of metal workers e.g. in a cooperative.	Local basis for production and collection of metal established.	Production of e.g. 500 stoves yearly and kilns according to user demand.	Ensure that energy resource allocation yields greater social end economic benefit.	Promotion of labour intensive production increasing employment
Survey possible scrap metal sources and and design routine for collection.				
Adjust new stove and kiln designs to local traditions and habits	Suitable designs of both stoves and kilns developed.			Small scale rural industrialization.
Supply tools for 10 metalworkers and maybe a new building.	10 trained metal workers and the facilities for production provided	Basis for a self-sustained continued production of the products established	Improve energy supply for rural and urban households.	Expansion of the training facilities.
Training course in production of new stove and kiln design				
Demonstrations of new stoves on market places and in some low-cost housing areas.	Market response to the new ideas and introduction of the basic saving concept.	Sale of the annual production through traditional market structures.	Minimize the costs of energy.	General rural development.
Organise network for dissemination of the new type of stoves.	The basic sales structure for later dissemination established.	Reduction of the annual consumption of charcoal by 10% growing by 5% next 4 years.	Conserve energy.	
Involve charcoal burners in design and test of kilns and find appropriate type of financing for the investments.	Participation of the existing users in development process.	Improvement of the charcoal production efficiency by 5% growing to 25 % in 5 years.	Minimize possible environmental consequences of the energy supply and consumption.	
TIME SCHEDULE				
0 Year	1	2	4	

Fig. 7.5. Means/Aims hierarchy

involves will be accepted in practice. The present activities in the DOE in this phase are as mentioned limited, so the module will not relieve any work, but on the contrary introduce more in an already overburdened situation. This discussion will be taken up again in the conclusion.

The two other quantitative modules are different with regard to this last question because generally accepted terminology is used, and as mentioned earlier some parts of the calculations are already being performed manually in the existing analysis work. Consequently, at this level the model may make the existing work more comprehensive and to some extent easier.

The resource module

The resource module is also structured around a menu, which is shown in Fig. 7.6. But while the preparation menu is designed with a consecutive process in mind from problem analysis to elaborated proposal, the resource menu is divided into two separate parts: the input side where the user enters the consumption data, the resource base and the conversion factors, and the output side where the model presents some straightforward aggregations and statistics on respectively general energy and wood source criteria.

RESOURCE MODULE MENU

INPUT FORMS		OUTPUT FORMS	
Household	Tertiary	Energy consumption status	
A : High	K : Service	Q : Sectors and Total (GJ)	1988
B : Middle	L : Administration	R : -- : -- (GJ)	1993
C : Low	M : Schools	S : -- : -- (GJ)	1998
D : Subsist	N : Water works		
E : Alt.	O : Health centers	Wood source	
		1 : Wood resource status	1993
Agriculture	Other inpuut	2 : Wood resource status	1998
F : Large	P : Conversion factors	3 : Wood cons/sup status	1988
G : Medium	W : Wood resource data 1988	4 : Wood cons/sup status	1993
H : Small		5 : Wood cons/sup status	1998
Industri		F8 : RETURN TO INTRODUCTION	
I : Formal	F1: RETURN TO PRAM MENU	F9 : PRINT THE WORKFRAME	
J : Informal		F10 : RETURN TO THIS MENU	

Fig. 7.6. Resource module menu

The input sheets are kept very simple and have been designed with the experience from the Zambezi survey [21] as basis, and it is also possible to use the module for statistical analysis of survey results without connection to any project analysis.

The input forms for the consumption data are similar in principle and a few examples are shown in the Figs. 7.7 and 7.8.

Datasheet for high income households

DISTRICT: Zambezi	1988	1993	1998
Total number of households	70	75	75
Average household size	5.40	5.40	5.25
Average consumption			
-- Electricity(Kwh)	3700	4200	4500
-- Charcoal(Kg)	600	200	0
-- Firewood(Kg)	330	0	0
-- Kerosene(L)	0	0	0
-- Bottle gas(m^3)	0	0	0
Wooduse other purposes(kg)	150	100	100

Fig. 7.7. Input for high income households

Datasheet for the tertiary sector
- subsector : administration

DISTRICT:	1988	1993	1998
Total number of institutions	7	7	7
Average number of employees	54	60	60
Energy consumption			
Office use			
- Electricity(Kwh)	4000	5000	5000
- Kerosene(L)	20	0	0
- Charcoal(kg)	0	0	0
- Fuelwood(kg)	0	0	0
Transport - Diesel(L)	1000	1000	1000
- Gasoline(L)	0	0	0
Wood use - Building material	0	0	0
- Other	0	0	0

Fig. 7.8. Input for administrative uses

The relevant years are selected in the introduction form, as it is shown in Fig. 7.2, and the first year figures will ideally be actual survey data or available statistical material. Some of the future tendencies on a very general level may also be available for instance for a number of households and average family size. The future consumption figures must be estimated, but the idea is that they should either emerge from the aims of the analysed proposal, or be established as targets and then used in a "what if" calculation, where the necessary level of savings for a certain target would establish the aims for the proposal. In the household form, Fig. 7.7, this is illustrated for the electrification example by the increase in electricity consumption for this high income group and a drastic reduction in wood fuel use. In the various output forms the consequences of the energy consumption and wood source criteria can then be seen. In practice the user interacts simply by entering the necessary figures in the input form and then with a single key stroke bringing the desired output sheet on the screen in a recalculated version, where the entries have been included. This very simple process should in particular stimulate sensitivity calculations, because it is possible within a few seconds to change any desired parameter and see the result on the output form. The earlier described flexibility is also underlined by these possibilities and is supported by the fact that only very few of the forms are conditional. The conversion factors and efficiencies are naturally always necessary, but the factors will usually not require to be changed, so they can eventually be kept as a fixed part of the form shown in Fig. 7.9.

Improvement of the conversion efficiencies will as in the two examples often be a project objective. In the present example it is illustrated how the results of the two described projects will be expected to affect the future efficiencies.
With these factors established it is possible to perform analyses at all levels from a single subsector to a whole community by choosing only the consumption input forms that are considered relevant in a specific analysis situation, and then calculate the related results of various actions.

CALCULATION VALUES FOR CONVERTING CONSUMPTION DATA
-- values may be changed to match local conditions --

Conversion Efficiencies :

		1986	1996	2006
Charcoal/Wood	(Kg~Kg)	.125	.150	.200
Diesel/Electricity	(L/Kwh)	.400	.350	.300
Electricity Distribution		.900	.900	.900

Conversion Factors
(to Giga Joules)

Wood(kg)	.0155 GJ
Charcoal(kg)	.0326 GJ
Kerosene(L)	.0351 GJ
Diesel(L)	.0387 GJ
Electricity(Kwh)	.0036 GJ
Bottle gas( )	.00 GJ
Gasoline(L)	.00 GJ

Fig. 7.9. Conversion factors

The structure of the input figures is as mentioned very simple and the limited number of years in the forms are naturally a restriction. A user with some experience can, however, easily make a whole time series by running the module a number of times. Instead of filling numbers in every cell, it is possible to enter simple formulas that connect the future values to the first year entry, for example by annual increments or other rules.

The last important input form to be discussed in detail is the wood resource data sheet. It is presented with the actual Zambezi data as basis in Fig. 7.10. It must be emphasized that the important availability and yield factors are very uncertain estimates.

The land use categories are the official Zambian ones from the Forestry Department (FD) statistics and the land areas are the actual ones for Zambezi. The figures for standing stock are estimated, but should be valid for the specific area. The yield factor is also a figure that generally will be possible to obtain in the practical situation from the FD, although some variations will have to be expected according to region, rainfall, etc.

WOOD RESOURCE DATABASE
District : Zambezi
YEAR : 1988

Land use /vegetation	Land Area	Stock	Availability	Yield factor	Yield
Town / Village	1	1	100	3	30
Cultivated land	10	3	100	5	1500
Grasslands	794	1	15	6	7146
Miombo woodland	22	25	3	7	1155
Kalahari woodland	748	18	2	6	16157
Mopane woodland	0	0	0	0	0
Munga woodland	0	0	0	0	0
Bush	3	0	0	0	0
Evergreen forest	220	33	3	10	21780
Deciduous forest	23	40	3	10	2760
Plantations	2	50	0	17	0
Swamps	1	0	0	0	0
Open Water	0	0	0	0	0
TOTALS/AVERAGES	1824	12.67	3.22	6.78	50528

	Charcoal	Wood
Import	0	0
Export	0	0

Land area in 1000 ha
Standing stock in tonnes per ha
Availability as the percentage that can be reached
Yield factor as the increment percentage available each year
Accessible wood yield in tonnes

Fig. 7.10. Wood resource database

The availability factor is much more problematic in the sense that it has to be based on rather uncertain ideas about which areas actually are of importance as basis for both the woodfuel collection and the charcoal production. It is not just a question of direct accessibility, although that is evidently a very important parameter. Other aspects also have to be considered, such as the different status that is attached to various types of land like e.g. protected state forest and game areas, communal land, privately owned or "free" areas.

This status is essential for whether fuelwood is actually available from the area. Furthermore, the different types of trees in the individual areas are not all of the same relevance as fuelwood and seasonal variations might also be important. For a more detailed discussion see the LEAP model [28], where an accessibility parameter is used on a more detailed level.

The expected practical use in this context, where only very limited field studies and data are expected to be available, will be of a very pragmatic nature. Some considerations can be made on the basis of studies of maps, but that will only provide a rough estimate which may be very uncertain. The basic concept of availablility is as decribed also very difficult to define precisely, so uncertainty about, what the "true" figure is, will always exist. It is, however, a very important factor for the calculation of the available yield, and small variations in the availability of a larger land area result in large impact on the wood source situation. Sensitivity analysis of this parameter is therefore highly recommended.

These selected forms should give a general picture of the input work that is necessary for the resource module. The two examples have not been used for a more detailed description, because that would involve presentation of a number of rather identical forms, and that is not found to be appropriate in this fairly short introduction to the PRAM model. The basic input for the consumption data and for the conversion factors shown in Fig. 7.7-7.9, however, reflect the expected tendencies of the two examples.

The output side consists of three different types of forms:
- an energy consumption status for each of the selected years
- a wood consumption and supply status, and
- a resulting status for the wood resource situation for the two selected time periods.

The summary sheet for energy consumption shown in Fig. 7.11 is a simple conversion and aggregation of the entered detailed consumption data presenting the results of each input form and summaries on sector level and as an overall total. In the present version of the model the electricity production is based on local diesel systems and the output results are gross figures where the efficiency of production and distribution is included. This means that it is the energy content of the amount of diesel used for the production of the consumed electricity that is the basis for the output figure.

SUMMARY SHEET FOR SECTORAL ENERGY CONSUMPTION(GJ) YEAR: 1988

DISTRICT: ZAMBEZI

Household sector(GJ)

Subsector/ source	Electri-city	Char coal	Fire wood	Kero sene	Gas-oline	TOTAL	PER CAPITA
HIGH INCOME	4455	5208	358	0	0	10021	27
MIDDLE INC.	2580	26660	7091	0	0	36331	18
LOW INCOME	0	39370	15500	702	0	55572	15
SUBSISTENCE	0	128960	282100	5704	0	416764	11
OTHER	0	0	0	0	0	0	0
TOTAL	7035	200198	305049	6406	0	518688	11

Agricultural sector(GJ) YEAR : 1988

Subsector/ source	Electri-city	Char coal	Fire wood	Kero sene	Diesel	TOTAL
Large farms						
-domestic	0	2170	217	25	-	2412
-productive	0	-	-	-	95	95
Medium farms						
-domestic	0	0	0	0	-	0
-productive	0	-	-	-	0	0
Small farms						
-domestic	0	0	0	0	-	0
-productive	0	-	-	-	0	0
Total	0	2170	217	25	95	2506

Industrial sector(GJ) YEAR : 1988

Subsector/ source	Electri-city	Char coal	Fire wood	Kero sene	Diesel	Gasoline	SUM
Formal	0	0	0	0	0	0	0
Informal	155	0	0	0	0	0	155
Total	155	0	0	0	0	0	155

Tertiary sector(GJ) YEAR : 1988

Subsector/ source	Electri-city	Char coal	Fire wood	Kero sene	Diesel	Gasoline	Total
Adm.-Office	339	0	0	5	--	--	344
-Transport	--	--	--	--	271	0	271
Hospitals	344	12	0	0	0	--	356
Clinics	--	--	0	0	0	--	0
Schools	0	0	0	0	0	--	0
Service-Int	516	930	233	9	--	--	1687
-Transport	--	--	--	--	209	0	209
Water works	1720	--	--	0	0	--	1720
Wells	0	--	--	--	0	--	0
Total	2919	942	233	14	480	0	4587

TOTAL FOR ALL SECTORS(GJ)

YEAR : 1988

Subsector/ source	Electri-city	Char coal	Fire wood	Kero sene	Diesel	Gasoline	TOTAL
Households	7035	200198	305049	6406	--	0	518688
Agriculture	0	2170	217	25	95	--	2506
Industry	155	0	0	0	0	0	155
Tertiary	2919	942	233	14	480	0	4587
Total	10108	203310	305499	6444	575	0	525936

Fig. 7.11. Summary sheet for energy consumption

The energy equivalent for charcoal is based on the same gross principle, i.e. the energy content of the wood used for production of the consumed charcoal. As illustrated in Fig. 7.9 this is where the conversion efficiency of the kiln types is important just like the production efficiency of the diesel power station. For the other sources no local conversion has taken place, and the figures are therefore based on the direct energy content.
No indirect energy use for e.g. transport of the fuels has been included in order to keep the analysis simple, but for instance the costs related to truck delivery of diesel for the power station might be a relevant parameter in the economic analysis.

Although the calculations between input data and the results are rather simple and straightforward, it would be very time consuming to perform them in a manual way, especially when the possibility of making the "what if" type of calculations is included. The module is therefore expected not so much to relieve existing work as allow for more detailed and comprehensive analysis of the possible range of actions.

The second type of output form is shown in Fig. 7.12. This is simply an account of the total wood supply from the wood resource base regulated for exports and imports of woodfuel from and to the studied area and then a consumption side based on the sector input forms. These consumption figures also include the other categories of wood use like building material and fencing that are not a part of the energy aspect. The energy figures are also here gross, meaning that charcoal conversion efficiency is included in order to represent the total wood use.
The resulting surplus/deficit figure is naturally interesting as a measure of whether the supply situation is stable for the present and the expected future consumption. It is also a simple objective that can be used for measuring different types of actions. For instance the effects of conservation measures like in the stove and kiln example could be compared with changes in the supply from increased plantations, changes in the availability

through new access status, for example. In that way the relative efficiency of the possible activities can be found.

STATUS SHEET FOR THE WOOD SUPPLY SITUATION

SUPPLY Year : 1988			
Accessible annual yield	:	50528 tonnes	(dry wood)
Imports - exports (wood)	:	0 tonnes	--:--
Imports - exports (charcoal)	:	0 tonnes	--:--
Available wood supply (without stock cutting)		50528 tonnes	--:--
CONSUMPTION Year : 1988			
Household consumption			
--firewood	:	19681 tonnes	(dry wood)
--charcoal	:	12916 tonnes	--:--
--poles etc	:	2811 tonnes	--:--
Industrial wood use			
--energy purposes	:	0 tonnes	--:--
--raw material	:	1 tonnes	--:--
--building material etc.	:	0 tonnes	--:--
Agriculture			
--energy purposes	:	154 tonnes	--:--
--building material	:	0 tonnes	--:--
--fencing etc	:	30 tonnes	--:--
Tertiary sector			
--energy purposes	:	76 tonnes	--:--
--building material	:	4 tonnes	--:--
--other	:	0 tonnes	--:--
Total annual wood consumption	:	35671 tonnes	(dry wood)
TOTAL ANNUAL SURPLUS/DEFICIT(-)	:	14857 TONNES	(DRY WOOD)

Year : 1988

Fig. 7.12. Status for wood use and supply

The resulting figure is also used as a basis for the last type of output from this module, the forms presenting the wood re-

source base for the two desired intervals. As shown in Fig. 7.13 this output form is directly similar to the wood resource input form (see Fig. 7.10) except for the yield factor of the different types of vegetation, which is considered constant. The data in the form is generated directly from the resource input in situations where the result of the wood use and supply calculation shows a surplus situation. This means that the surplus does not result in an increase in the stock, but is simply seen as waste in the natural regeneration process of the vegetation.

WOOD RESOURCE DATABASE
District : Zambezi
YEAR : 1993

Land use /vegetation	Land area	Stock	Availability	Yield
Town / Village	1	1	100	30
Cultivated land	10	3	100	1500
Grasslands	794	1	25	11910
Miombo woodland	22	25	10	3850
Kalahari woodland	748	18	10	80784
Mopane woodland	0	0	0	0
Munga woodland	0	0	0	0
Bush	3	0	0	0
Evergreen forest	220	33	3	21780
Deciduous forest	23	40	3	2760
Plantations	2	50	100	17000
Swamps	1	0	0	0
Open Water	0	0	0	0
TOTALS/AVERAGES	1824	13	8.90	139614

	Charcoal	Wood
Import	0	0
Export	0	0

Land area in 1000 ha
Standing stock in tonnes per ha
Availability as the percentage that can be reached
Accessible wood yield in tonnes per ha

Fig. 7.13. Wood resource base

In the situation where there is a deficit, the result is implemented as a linear reduction of standing stock according to the availability of the individual areas. This naturally leads to reduced yield and acceleration of the process. The availability factors will be taken automatically from the input form, but if changes are a part of the study, it is possible to overrule the automatic calculation by simply typing a new number in the specific cell.
The assumptions about the wood-stock changes in situations with either surplus or deficit are not considered to be a reflection of the real situation, which will be much more complex. Surplus situations could lead to increased standing stock or changes in the size of the land use areas, but this would depend on a number of other factors affecting the situation like soil fertility, rainfall, etc. and other types of wood depletion such as the clearing of areas for fields in shifting agriculture. These factors have not been included in this limited model, because a totally different level of detail would be required. This would not match the actual planning situation.
On the basis of these restrictions, the assumptions are kept simple in order to make the calculations as transparent as possible. With the uncertainties on the available data material in mind, the results will always have to be used with caution. The important aspects of the calculations will be to compare results of different actions and not to find the precise quantity of fuel that might be used as criterion in the comparison.

If, however, the user requires other types of relations between surplus/deficit and the stock and yield situations, it will be fairly easy to change the formulas in the underlying programme. The formulation of the model in the spreadsheet structure means that most of the calculation programmes are performed on the hidden formula page of either the form itself, a cell or both. Because of this decentralized structure only the specific part has to be changed in a situation like the described.
The specific structure of the programming language and the editor included in the basic software will not be described here, because it is not of any direct interst to the PRAM user, but

it resembles other common programming languages and an experienced programmer could master it with only a brief training period.

The socio-economic module

The structure of the socio-economic module is in most ways similar to that of the resource module with some basic input forms where the information and assumptions about the analysed activity are entered, and some output forms where the results on different criteria are evaluated. In addition to the direct input and output forms there are the forms for the economic data and results, where a part of the data is generated from the project input and another part has to be entered directly in the form. The menu is shown in Fig. 7.14, and the module functions like the other two through single keystrokes.

SOCIO - ECONOMIC MODULE MENU

INPUT FORMS	OUTPUT FORMS
Project definition	Financial results
A : Project base data	Financial cash flow
B : Economic base assumptions	5 : Period 1988 - 1992
C : Electricity system definition	6 : Period 1993 - 1997
D : Fuel and source prices	7 : Period 1998 - 2002
E : Employment quotas - men	8 : Period 2003 - 2007
F : Employment quotas - women	H : Net present value - C/B ratio
G : Energy transformation values	I : Internal rate of return
Economic cash flow	
1 : Period 1988 - 1992	Economic results
2 : Period 1993 - 1997	J : Net present value - C/B ratio
3 : Period 1998 - 2002	K : Internal rate of return
4 : Period 2003 - 2007	L : Cost/benefit efficiency
F1 : RETURNS TO INTRODUCTION	M : Social cost-benefit
F2 : RETURN TO PRAM MENU	N : Import value 1988 - 1997
F9 : PRINT THE WORKFRAME	O : Import value 1998 - 2007
F10 : RETURN TO THIS MENU	P : Employment valuation

Fig. 7.14. Socio-economic module menu

From the headings of the various forms it is evident that the module is fairly traditional with respect to the earlier dis-

cussion of cost-benefit analysis. But it is specifically designed for energy related aspects in the input forms. While the resource module used fixed time intervals and only the whole periods for wood source assessment, the economic analysis is predefined for a 20 year period, and only the starting year is entered in the introduction form. The limitation is only upwards because longer periods cannot be used in the existing version of the model, but not downwards in the same way, because each five year form is independent and only the ones, where data has been entered will contribute to the output calculations. For the financial analysis the amortisation period of any loans is entered as one of the economic base assumptions.

The module is designed for chronological use in the sense that it is naturally necessary to calculate the financial and economic time series before the desired evaluation criteria is selected. For consistency reasons all the necessary forms are automatically recalculated before the resulting criterion is shown on the screen. This need for chronological use is only valid for the mentioned basic time series. While the input and other output forms can be selected independently and just the directly necessary data for the specific analysis has to be entered. For instance when it is the economic results that are of interest, the financial input and output forms can just be neglected.
The first input form for the project base data is shown in Fig. 7.15, and it is the direct energy aspects of the project that has to be entered here in the common user terms. The data are from the substitution example, and it shows the existing present annual fuel use with the old diesels as the amount substituted and the yearly consumption with the new diesels is the amount used. Any mix of fuels is possible, but it is a weakness in the present version of the model that the amount is fixed from the start to the end of the period. In practice there will normally be a penetration period first and then a full substitution with likely changes in the future. So this is an aspect that has to be elaborated into a genuine time series in the next version of the model.

Project Base Data

Project :New diesel engines
Scenario :testcase

Fuel use and substitution

Fuel type	Use (gross)	Substitution(gross)	// Project type	number/size	unit
Fuelwood(m^3)	0	0	//End-use technology	0	
Charcoal(t)	0	0	//Conversion --:--	0	
Kerosene(1000L)	0	0	//Elec.prod. --:--	0	
Diesel/Gasoil(1000L)	1300	2500	//Heat prod --:--	0	
Straw(t)	0	0	//Resource	0	
Gasoline(1000L)	0	0	//==========		
Fuel oil(t)	0	0	//		
Natural gas(m^3)	0	0	//		
Coal(t)	0	0	//		
Electricity(Kwh)	0	0	//		

Fig. 7.15. Project base data

The additional small table with project type and number of units is only for use in the cost-efficiency criterion, designed for projects where economic savings and income are not relevant, and therefore a cost per unit may be the only possible basis for comparison.

The necessary basic economic assumptions are listed in Fig. 7.16, and as already mentioned it is necessary to enter just the data that is considered relevant for the specific analysis. For instance the inflation rate, market interest rate, V.A.T., private taxation, subsidies and the detailed loan informations are only relevant for the financial calculations and can be omitted in an strictly economic analysis. This indicates that the economic prices do not include taxes and subsidies, because it is just internal transfer of money from a state point of view, this level of shadow pricing does therefore not involve any value judgement, and is not found to contradict the discussion and critique of the cost-benefit analysis. Because the analysis in this way is based on the real values (not the nominal) of the involved components merely changes in the relative prices are included and not the inflation which is relevant only for the nominal values. This also underlines the general conclusion in

the discussion of analysis methods that economic criteria do not present a "true" figure, but if the value judgements are excluded from the analysis it can be used for comparison of alternatives.

Basic Economic Assumptions

Project: New diesel engines
Scenario: testcase

Parameters	Values - 1988			
Inflation rate(%)	6			
Interest rate(market)(%)	10			
Interest rate (state)(%)	10			
V.A.T.(%)	0			
Privat taxation(%)	0			
Currency(name/name)	kwacha / ngwee			
Exchange rate (1 US $=)	5			
State subsidy(%)	0			
Loans:				
- amort. period(years)	20	interest(%)	Local(%)	Foreign(%)
- Type				
- Annuity (percentage)	100	3	20	80
- Serial --:--	0	0	0	0
- Index --:--	0	0	0	0

Fig. 7.16. Basic economic assumptions

In Fig. 7.17 the form for fuel and source prices are shown, and as described it is the net prices and the real growth rates that are used and taxes are kept separate. The import quota is included for the specific calculation of the total import effects of the activity, a criterion that might be interesting to supplement the direct economic evaluation.

Prices for the most commonly used fuels and electricity

Project : New diesel engines
Scenario : testcase

Fuels/ Sources	Prices(net) (kwacha)	Growth rate(%)	Taxes (kwacha)	Import quota(%)
Gasoil/Diesel(1000L)	1600	5	0	100
Fueloil(ton)	0	0	0	0
Coal(Ton)	0	0	0	0
Kerosene(1000L)	0	0	0	0
Natural gas(m^3)	0	0	0	0
Gasoline(1000L)	2000	5	0	100
Charcoal(ton)	400	4	0	0
Fuelwood(m^3)	0	0	0	0
Straw(ton)	0	0	0	0
Electricity(Kwh)	-	-	-	-
- unit charge	0	0	0	0
- fixed+m.d. charge	0	0	-	0
- econ. grid price	0	0	-	-

Fig. 7.17. Price form

The only figures that are not entered directly by the user are the electricity prices. These are found from another form (not shown here) where basis data for the economic price are entered and automatically calculated and transferred to this price sheet. The real unit and fixed charges are found through a question/answer process with the user, where the answers lead to a specific consumer tariff, which is then transferred from the electricity form, where the existing Zambian tariff structure and prices are listed.

The remaining input forms are not described in detail, because the two employment quota forms that are used for simple shadow pricing of labour on three categories have mainly been included in the model as an option for more policy oriented planning than can be expected in the existing practice. The shadow price is not used in the traditional way as a substitute for the real price, but it has been included as a basis for the "what if" type of analysis. In the output form for social cost-benefit (see Fig. 7.23) the net present values for the main parameters are presented with the real and the shadow price respectively. It is then possible to compare the effects of the two price

sets, and in that way the shadow price actually functions as an elaborate sensitivity calculation for the labour input. It must therefore be emphasized that the terms "shadow price" and "social cost-benefit" do not have exactly the same meaning in the model as in the earlier described literature, but as there even in that literature is no clear consensus, the terms will be maintained here due to their explanatory value.

The last form with energy transformation values contains a set of necessary conversion factors similar to the form in the preparation module.

The time series for the economic result are illustrated in Fig. 7.18 with one of the four forms that, apart from the years, is identical in principle.

Economic activities (kwacha) Period : 1988 - 1992

Project: New diesel engines Scenario: testcase

Activities	1988	1989	1990	1991	1992
Investments	6000000	0	0	0	0
- materials	5000000	0	0	0	0
- import quota(%)	100	0	0	0	0
- labour	1000000	0	0	0	0
- local part(%)	75	0	0	0	0
Operational costs	50000	130000	150000	200000	200000
- materials	0	30000	50000	100000	100000
- import quota(%)	100	100	100	100	100
- labour	50000	100000	100000	100000	100000
- local part(%)	100	100	100	100	100
Fuel costs	2080000	2184000	2293200	2407860	2528253
Fuel savings	4000000	4200000	4410000	4630500	4862025
Revenues	0	0	0	0	0
Cash flow	-4130000	1886000	1966800	2022640	2133772
Accum.cash flow	-4130000	-2244000	-277200	1745440	3879212

Fig. 7.18. Economic results

The figures for investments are generally entered as a total sum in the first year, although in practice they may be stretched over a longer building period. Later reinvestments are entered in the appropriate anticipated year. The operational costs are

entered for each year, which is rather laborious, but it can easily be automated by creating small calculation rules. Data are entered on the two posts material and labour and is then automatically added in the heading line. The two percentages are optional and are only used in the resulting import calculation.

Fuel costs and savings are automatically generated using the base data, prices and transformation values. While the revenues have to be entered by the user.
The resulting annual and accumulated results are also calculated automatically at the start and when new entries have been made. Together the two figures give the user a general idea about the changes in the time period, but can not be used directly as an expression of the liquidity, due to the use of economic prices.

The output forms with the financial cash flow are structured in the same way as the economic results, but the content is quite different, as it is shown in Fig. 7.19.

Cash Flows - current prices : 1988 - 1992

Project: Scenario:

Activities	1988	1989	1990	1991	1992
Net payment	403294	403294	403294	403294	403294
- repayment	223294	229993	236893	244000	251320
- remaining debt	5776706	5546713	5309820	5065820	4814501
- gross interest	180000	173301	166401	159295	151975
- net interest	180000	173301	166401	159295	151975
Operational costs	50000	137800	168540	238203	252495
- materials	0	31800	56180	119102	126248
- labour	50000	106000	112360	119102	126248
Fuel costs	2080000	2315040	2576640	2867800	3191861
Fuel savings	4000000	4452000	4955076	5515000	6138195
Revenues	0	0	0	0	0
Cash flow	1466706	1595866	1806602	2005702	2290544

Fig. 7.19. Financial results

What was listed as the first year investment in the economic form is here treated as a loan over the selected amortization period (see Fig. 7.16) and the interesting components like repayment, remaining debt and gross and net interest are calculated and presented in the form leading to the resulting net payment for the individual years.
Describing the calculation principles for the different loan types will lead too far, but the reason for the presentation of the various components mentioned above is, that it will help the user to separate the effects of different possible actions in a sensitivity analysis.
The operational costs, fuel costs and savings, and revenues are principally the same as in the economic form but in market prices. In this case, however, the real market prices are used, including taxes, subsidies, inflation, etc.
The final cash flow is simply found as the resulting annual gain or loss and can here be taken directly as the liquidity for the private investor.
It is naturally important to remember that the financial calculations are included as an aid for studing the effect of a project on an involved private investor. In practice in Zambia this is relevant for many of the projects where the parastatal companies are involved, such as the electricity substitution example, where the electricity corporation naturally is interested in the effects this project will have on their finances rather than on those of the society as a whole. It will therefore often be relevant to consider both the general economic and the specific financial aspects in the sector level analysis.

The economic and financial time series are on their own an evaluation of the results of the analysed activity, but because flows of this type are very difficult to evaluate and almost impossible to use for comparison between alternatives, more aggregated criteria have been developed, as described in the methodological presentation. Since the commonly used criteria all have their advantages and disadvantages, it was decided to include them all, and it is then up to the user to choose whether one or more of the criteria are going to be applied.

Since the principles behind the criteria have already been described (see section 4.2), they shall not be repeated here, but as can be seen in the module menu in Fig. 7.14 the following criteria are available for both the economic and the financial results using the established time series:

- Net present value
- Cost-benefit ratio
- Internal rate of return

The forms for these calculations are shown in Fig. 7.20 and 7.21.

Net Present Value (NPV) calculation
(kwacha)

Project : New diesel engines Scenario : testcase

Calculations of the Economic net present value			Economic Cost-Benefit Ratio
Investments	-5454545		CBR:= NPV - benefits / NPV - costs
Operational costs	-526377		
Fuel costs	-15474809		
Fuel savings	29759249		
Revenues	0		Actual CBR
Total NPV	8303517		CBR = 1.39
NPV of Imports	-10329054	//	Foreign loan : 4800000

Fig. 7.20. Economic net present value and benefit/cost ratio

By separating the present value of each component it is made easier for the user to see the relative importance. It also increases the validity of the "what if" calculations, because each component can be changed individually.

Calculation of the economic
Internal Rate of Return

Project : New diesel engines
Scenario: testcase

IRR = 25.4 % (precision +/- 0.1%)

IRR presents the rate of return where the Net Present Value - NPV of the economic cash flow is zero.

Fig. 7.21. Economic internal rate of return

The inclusion of a NPV of imports is related to the supplementary economic evaluation of the import effects. The time series for the total import is calculated in separate forms, which are established directly from the figures and percentages entered in the various input forms, and due to fossil fuel saving for example, the import effects may actually be negative as a result of less imported fuel.

Import amounts of investments, operational costs and fuel substitution 1988 - 1997

Activity	1988	1989	1990	1991	1992
Investments	5250000	0	0	0	0
Operational costs	0	30000	50000	100000	100000
Fuel substitution	-1920000	-2016000	-2116800	-2222640	-2333772
Total import	3330000	-1986000	-2066800	-2122640	-2233772

Activity	1993	1994	1995	1996	1997
Investments	0	0	0	0	0
Operational costs	100000	100000	100000	100000	100000
Fuel substitution	-2450461	-2572984	-2701633	-2836714	-2978550
Total import	-2350461	-2472984	-2601633	-2736714	-2878550

Fig. 7.22. Import effects

The last evaluation form called social cost-benefit has already been mentioned in relation to the employment quotas. This type of evaluation is mainly seen as an extra level of detail in the analysis of the project's sensitivity to the use and price of labour. The form is shown in Fig. 7.23 and it is relevant that the so-called shadow factors for the price of labour are used not instead of the actual prices but as additional feature, where the direct resulting effect can be compared with the ordinary results.

Social cost-benefit analysis with social labour costs
Project: New diesel engines (kwacha)
Scenario : testcase

Activity	NPV's Real costs	NPV's Social costs
Investments	-5454545	-4772727
Operational costs	-526377	-588931
Fuel costs	-15474809	-15474809
Fuel savings	29759249	29759249
Revenues	0	0
Total NPV	8303517	8922781

Fig. 7.23. Social cost-benefit results

The import and social cost-benefit forms are naturally independent, and as with the other criteria it is the user's decision whether or not to use them.

In order fully to present the different features and especially the flexibility, it is naturally necessary to see the model in function on a personal computer. However, an attempt has been made in the presentation to give a fair picture of the different modules, their present limitation and their advantages in relation to the specific planning situation.

When the developed model is evaluated, it is natural to look at the demands and conditions that formed the basis for the development (see section 7.3). As the model has not yet been used in practice, the evaluation is mainly based on the experiences obtained from a presentation and some joint exercises in the DOE with a preliminary version of PRAM.
The main points can be summarized as:

- The basic idea of implementing the approach on a micro-computer was well received, because other computerized tools were being introduced at the time.

- The flexible and modular structure was seen as an important feature in order to limit the work of the user to what is absolutely necessary. Suggestions for further disaggregation were presented.

- The menu-based structure was found to meet the demands for user-friendliness. The first reactions showed, however, that it was not simple for new users to start working with the model. The presentation on the screen was very different from what the DOE staff was accustomed to. It was therefore found that training in both the use of PRAM and the basic software was absolutely essential.

- Without real practical use it was not possible to judge whether the different modules covered all the essential aspects, but it was clear that, particularly collection of input data for the energy and wood source module would be difficult. This was, however, a result of a general lack of data about wood-use and not due to any special demands of the model.

- The quantitative modules were as expected found to be the most directly relevant, since they resembled parts of the existing work. It was possible to understand the connections between the forms directly, although some explanations were necessary. So although there are no hidden assumptions built into the model, it is not directly transparent for new users.

- Methodological questions in relation to pricing rules in the economic analysis were not discussed as the consciousness about such aspects was generally very low. An appropriate introduction of the model would therefore also require a general education element on the background of the methods used.

These points are expected to be of quite general validity. If the model were adapted to a similar institution in another country it is likely that the basic reactions would be comparable. These experiences are therefore considered to represent a reasonable evaluation of the model at the present stage.

It is, however, important to emphasize that the model is regarded neither as a finished nor complete tool. Practical user experience is still lacking and will inevitably lead to a number of wishes and requirements for additions, changes and modifications.

8. CONCLUSION AND EVALUATION

8.1. Introduction

When the study was started the underlying assumptions were described in three main points:

- There is a general tendency in many developing countries towards increasing importance of micro-level project planning at the expense of macro-level national planning, and this tendency places project analysis activities in a central position.

- The energy sector is of growing national importance in most developing countries as a result of both a commercial and a "non-commercial" energy crisis.

- Research on project analysis and selection has focused on generally applicable methods, but it is important to design and adapt the methods to the specific political and administrative context where the actual user is situated.

Based on these assumptions the overall aim of the study was to establish new or alternative methods for project analysis with particular focus on the problems of rural energy planning. The methods should be based on insight into the actual development problems and the specific political and administrative structures.

Due to the early and close contacts to the Department of Energy (DOE) in Zambia, it was decided to aim the method development specifically at the planning situation in the DOE, and therefore also to use the Zambian society as the general empirical background.

This focus on one society and the planning situation within only one sector inevitably limits the generality of the experiences and the conclusions. This is naturally recognized, but in a limited study of this type, it has been found more important to establish the in-depth knowledge necessary for the specific method development, than to try to reach more general but less well founded conclusions.

During the study there has been both direct and indirect contacts to energy planning units in several other African countries. The general impression from these contacts is that many of the problems described in relation to the DOE [22] are similar to those experienced in the other countries. This indicates that the basic findings in the study do have some general validity also outside the Zambian context.

8.2. Evaluation of the basic assumptions

The above listed assumptions were mainly based on literature studies, but the empirical evidence from Zambia generally confirms the anticipated tendencies.

From the earliest contacts it was evident that although macro-level planning in the form of national development plans on a five-year basis officially were the basis for activities at a detailed level, the realities were different. As described in chapter 2 there are several general reasons for the failure of macro-level planning such as administrative limitations, lack of political will, dependence on international economic development, etc. The tendencies experienced in Zambia will therefore also be visible in many other developing countries, although there will be differences between how these tendencies manifest themselves according to the specific historical, political and social conditions of the individual country.

In Zambia the general reasons were supported by the rapid deterioration of the national economy that made any long-term planning efforts illusory and for instance the prepared Fourth National Development Plan (1986-90) has now been totally abandoned. Macro-level planning has therefore not been studied in any detail in this project, but the impression from Zambia and other countries in eastern and southern Africa is that even in the countries where national development plans, typically on five-year terms, are prepared, there are large differences between the aims invested in the plans and the political realities. The macro-plans generally present ambitious but at the same time vaguely formulated objectives. In that way the plans can be used to legitimize many different types of practical policy and planning. Whether there among the powerful groups is an actual will to try to follow the plans is difficult to assess, but the impression is that it is doubtful.
Even if the will to follow the plans did exist, it would be very difficult to perform the necessary inter-sectoral planning, in fact this level is generally found to be the weakest

in the planning process. This means that there are often no clear links between the macro-level and the micro-level planning efforts.

The second hypothesis about the importance of the energy sector shall not be discussed in any detail here, because this subject has been dealt with in the two previous reports of this study [21], [22]. The conclusions of these reports show the increasing importance and also the growing level of activity in the energy sector in Zambia. The present scarcity of funding from national sources means that foreign donors and banks have a very large influence on the actual activities.

This funding situation in many ways leads directly to the third hypothesis, as the influence of the international development organisations and the national aid-agencies are one of the main factors behind the described focus on the project level of planning. Development cooperation and assistance is to a very large extent based on projects. The organisations and agencies will always be interested in finding new projects, and the planning efforts within the developing countries will therefore be aimed at producing project ideas and proposals that are acceptable according to the different strategies of the individual donors.

With the restrictions on administrative resources and the continuous demand for projects, the possibilities for more comprehensive and coherent planning efforts are limited, and projects are therefore prepared and analysed on an individual basis. This is clearly the situation in the DOE although the actual analysis activities are very limited.

The analysis methods used are dominated by the requirements of the international organisations and in section 4.3 the influence of the World Bank is used as an example of this methodological dominance.

The impression from general literature on project analysis, case studies from other countries and the practical experience

from Zambia, is that economic analysis is regarded as very important in all phases of project planning. Other criteria and design parameters are naturally also used, but as a basis for approval decisions, the economic viability is the dominant criterion. The focus on the economic results is to a large extent a result of the growth-oriented development strategies pursued by many of the powerful international organisations. As discussed in chapter 4 it is therefore not a coincidence that cost-benefit analysis (CBA) has been promoted as the central project analysis method.

Without repeating the discussion and critique of the CBA and the later extensions in direction of including more social and distributional aspects (SCBA), the main conclusions are summarized in the following.
The CBA methods are to a large extent promoted and used in analysis situations where their validity is very doubtful, and results will often be directly misleading. The built-in value judgements are largely neglected and the consequences of the ideological foundation in the theory of welfare economics related to capitalist societies are also totally forgotten in the promotion and use of these methods. The conclusion in relation to appropriate use of CBA methods is that they are only relevant in the analysis situation where alternative solutions to the same problem are being studied. Even in this situation the underlying economic criterion should not stand alone, but be treated as one among other parallel criteria.

The dominance of CBA methods is also the major example of the assumption about tendencies towards focus on generally applicable analysis methods. The above conclusions therefore support the statement about the need for designing and adapting the methods to the specific context where the user is situated.

The developed PRoject Analysis Model (PRAM) is an attempt to make this type of specific approach. The model consists of a mixture of features that have been designed specifically for this situation and more traditional general methods that have been adapted to the special context.

8.3. Practical applicability of the developed approach

The developed model PRAM is presented in a user-oriented way in chapter 7 and only a few points will be summarized here.

The approach is based on two aspects that have been identified through the study as being very important for the outcome of the project planning process.
Firstly the central influence of the early identification and preparation phases due to the large number of selections that are performed here. Secondly, the need for qualitative analysis especially in relation to rural development problems. In chapter 5 a set of ideal guidelines for the analysis tasks in relation to rural development is established. The preparation module in the PRAM is a direct attempt to include some of these guidelines in a more limited and pragmatic approach.

Another result of the focus on rural development problems is the detailed possibility for analysis of the wood resource aspects in PRAM through the separate resource module. This is due to the fact that woodfuels are the totally dominant energy source in rural areas of most developing countries.

The third and last module is designed for simple economic and financial analysis and reflects the attitude towards CBA described above. The module is mainly designed as a tool for rapid analysis of alternative designs and the sensitivity of the key parameters. It can naturally also be used beyond the limits of the CBA validity. Deliberate misuse of this kind can naturally not be prevented, but through training and education the consciousness of the user about the limitations and value aspects can be raised.

As described in section 6.3 it is very difficult to assess the present possibilities for successful introduction of the PRAM in the DOE in Zambia. The actual development in the DOE has deviated substantially from what was jointly anticipated at the time when the premises for the PRAM were discussed, and the present project analysis activities are quite limited.

In a broader context the mentioned contacts to energy planning units in other countries indicate that the problems aimed at in the PRAM, are of fairly general validity. It must, however, be emphasized that the PRAM can only be seen as a first and rather simple attempt to develop a practical project analysis approach. It may also be added that, if the approach were to be used in another context, it would naturally be necessary to develop and adapt the module to the new specific conditions.

The impression after having worked with project analysis for a considerable period both practically and theoretically, is that there is a large need for future development particularly in relation to the analysis of environmental and ecological consequences. The wood source module in the PRAM is a very limited example in this direction, but it is only concerned with one direct aspect. More comprehensive approaches are required and although considerable efforts are being devoted to development of environmental impact assessment methods [68], it still seems as if the problem of measuring the consequences generally is treated through economic valuation and inclusion in an economic analysis. Both the principle and practical problems related to this type of extension of the economic analyis have been thoroughly discussed in chapter 4, and parallel criteria with a deliberate political ranking process as implemented in the PRAM are still found to be a better way of attacking the problems of value judgement.

8.4. Transfer of planning technology

At the end of the study it seems reasonable to ask whether the development and possible later introduction of this computerized project analysis tool is just another part of a general transfer of new types of planning technology from the developed to the developing countries.
It is probably not possible to give an unambiguous answer to this question, because there is naturally an element of technology transfer involved. On the other hand the development of

the tool is strongly based on specific problems and needs, and in that sense it might be considered to be developed for the specific context. Still, it is not a locally developed technology, but maybe it could be called appropriate for the local situation. The general discussion of the term appropriate technology (AT) will not be taken up at this stage. It is found that the term has almost lost its meaning, because it has been used and misused so often. For further discussion of AT, reference can be made to Müller [49] for a general discussion and to Ravn and Vidal [59] who relate the term specifically to the transfer of planning methods and approaches.

The distinction between technical and social operations research (OR) that is introduced in the latter work can also be used to illustrate the difference between this type of transfer of planning methodology and the one described earlier in relation to the introduction of cost-benefit methods in developing countries.

Core elements	Technical OR	Social OR
Theory	Actions based on prediction (a belief on positivism and a mechanical world view)	Actions based on education i.e. the development of wisdom (a purposeful world view)
Proposals	Optimization	To provide assistance to improve the quality of actions
Actions	The scientific method (objectivity)	Education and Participation (subjectivity)

Fig. 8.1. Technical and social OR (Ravn & Vidal, 1986)

The promotion of CBA was and is to a large extent based on the technical approach, where the analysis method is seen as a distinct technology and, because it is regarded as scientific

and objective, it can be transferred to entirely different societies and still be valid. In the earlier critique of the CBA methods this view of the methods is rejected, because both the theoretical basis and the scientific methods are found to be closely connected to the structures and prevailing ideology of the societies where they were developed.

The approach used in this study is in many ways similar to that of social OR since the most important aspects have been to help the DOE to improve their capabilities for solving their problems themselves. The learning process in both the development of the new method and in the use of it is regarded as equally important as the possible analysis results. This social OR approach is seen as a prerequisite for a successful transfer of any planning technique, but it is not in itself a guarantee for later adaption.

REFERENCES

1. ANAND, SUDHIR, NALEBUFF, B. (1985). Issues in the Appraisal of Energy Projects for Oil-Importing Developing Countries, World Bank Staff Working Papers 738 (Washington).
2. BALASSA, Bela (1976). The "Effects Method" of Project Evaluation, Working paper no. 231 (The World Bank, Washington).
3. BALL, Mike (1979). Cost-Benefit Analysis: a Critique. In Green, F. & Nore, P. (ed.): Issues in Political Economy (London).
4. BAUM, W.C. (1978). The World Bank Project Cycle. Finance and Development.
5. BIRGEGÅRD, Lars E. (1975). The project selection process in developing countries. (The Economic Research Institute, Stockholm).
6. BONNEVIE, H. (1980). Alternativ projektevaluering. Den Ny Verden 3/4, pp. 334-340.
7. BONNEVIE, H. (1981). Incorporation of Long-Term Goals in On-going Evaluations of Rural Development Programmes (Centre for Development Research, Copenhagen).
8. BRIDGER, G.A. & WINPENNY, J.T. (1983). Planning Development Projects (ODA, London).
9. BRUGGINK, J.J.C. (1984). Socio-Economic Aspects of Energy Planning in Developing Countries: Some Methodological Issues. (Energie Studie Centrum, Petten).
10. BRØGGER JENSEN, Per & HINDKJÆR, S. (1984). Projektevaluering af Energiprojekter i U-lande (The University of Copenhagen).
11. CARRIN, Guy (1984). Economic Evaluation of Health Care in Developing Countries (Sct. Martin's Press, New York).
12. CECELSKI, E. (1984). The Rural Energy Crisis, Women's Work and Family Welfare: Perspectives and Approaches to Action (ILO, Geneva).
13. CERNEA, M.M. (ed.) (1985). Putting People First. Sociological Variables in Rural Development (Oxford University Press).

14. CHAMBERS, R. (1978). Project Selection for Poverty - Focused Rural Development: Simple is Optimal. World Development vol. 6, no. 2, pp. 209-219.
15. CHAMBERS, R. (1983). Rural Development - Putting the Last First (Longman, London).
16. CHECKLAND, P. (1981). Systems Thinking, Systems Practice (J. Wiley & Sons, New York).
17. CHERVEL, M. (1974). Project Evaluation by the "effects" method in developing countries. Industrialization and Productivity no. 20, pp. 5-10 (UNIDO, Vienna).
18. CHERVEL, M. (1974). Exercise in the application of the effects method. Ind. and Prod. no. 20, pp. 11-21 (UNIDO, Vienna).
19. CHIDUMAYO, E.N. & S.B.M. (1984). The status and impact of woodfuel in urban Zambia. (Department of Natural Resources, Lusaka).
20. CHIDUMAYO, E.N. (1985). Population growth and energy consumption in Zambia (Natural Resources Department, Lusaka).
21. CHRISTENSEN, J.M. (1985). Energy Survey in Zambezi. Risø-M-2553.
22. CHRISTENSEN, John M. (1987). Energy Planning and Project Procedures in Zambia. Risø-M-2676.
23. CONYERS, Diana (1982). An Introduction to Social Planning in the Third World (J. Wiley & Sons, London).
24. DASGUPTA, S. MARGLIN & SEN, A. (1972). Guidelines for Project Evaluation (UNIDO, New York).
25. DEPARTMENT OF ENERGY (1985-87). Various unpublished material, personal communication, etc. (Lusaka).
26. DERMAN, W. & WHITEFORD, S. (ed.) (1985). Social Impact Analysis and Development Planning in the Third World (Westview Press, Colorado).
27. ELZINGA, Aant (1981). Evaluating the Evaluation Game (SAREC, Stockholm).
28. ETC-FOUNDATION (1987). Wood Energy Development - A Study of the SADCC Region. On behalf of the SADCC Energy Sector Technical and Adminstrative Unit (Luanda).
29. FORSS, Kim (1985). Planning and Evaluation in Aid Organisations. Dissertation (Ph.D.) (Stockholm School of Economics).

30. HANSEN, J.R. (1978). Guide to Practical Project Appraisal (UN, New York).
31. HETTNE, B. (1982). Development Theory and the Third World (SAREC, Stockholm).
32. HOSIER, R. (1982). Social Benefit-Cost Analysis of Fuelwood Development Projects. Working paper (Beijer Institute, Stockholm).
33. IMABLE, R. et al. (1982). Project Evaluation Methods and their Application: A Survey (University of Lund).
34. INTER-AMERICAN DEVELOPMENT BANK (1984). Guide for the Preparation of Loan Applications: Bio-Energy (Washington).
35. IRVIN, G. (1978). Modern Cost-Benefit Methods (Macmillan Press, London).
36. JESPERSEN, Per H. et al (1978). OR-Epistomology: Some Essays, Research report no. 1/1978 (IMSOR, Copenhagen).
37. KATONA, E. (1982). National Development Plans and the Standard of Living in Black Africa: The Zambian Case. Institute for World Economics (Budapest).
38. KJERSGAARD, A. et al. (1985). Teknologi og U-lande (IMSOR, Copenhagen).
39. KOMMISSIONEN FOR DE EUROPÆISKE FÆLLESSKABER (1976). Vurderingen af udviklingsprojekter der forelægges med henblik på finansiering gennem EØF (Bruxelles).
40. KRUGMANN, H. (1988). Improved Cookstove Programs: Boon or Boondoggle. IDRC-Reports Jan. 88, pp. 22-24 (Ottawa).
41. LAL, D. (1974). Methods of Project Analysis - A review, World Bank Staff Occasional Papers 16 (Washington).
42. LITTLE, I.M.D. & MIRRLEES, J.A. (1968). Manual of Project Analysis in Developing Countries, vol. II. Social Cost-Benefit Analysis (OECD, Paris).
43. LITTLE, I.M.D. & MIRRLEES, J.A. (1974). Project Appraisal and Planning for Developing Countries (Heinemann, London).
44. LYNGVIG, J. & VIDAL, R.V.V. (1984). Offentlig planlægning in Danmark (Akademisk Forlag, Copenhagen).
45. METODHANDBOKEN (1985). (SIDA, Stockholm).
46. MINISTRY OF OVERSEAS DEVELOPMENT (1977). A Guide to the Economic Appraisal of Projects in Developing Countries (London).

47. MISHAN, E.J. (1976). Elements of Cost-Benefit Analysis (G. Allen, London).
48. MUNASINGHE, M. (1983). Project Analysis and Energy Policy. In Neu, H. & Bain, D. (ed.) Energy Planning and Management in Developing Countries, pp. 341-365 (EEC, Brussels).
49. MÜLLER, Jens (1980). Liquidation and Consolidation of Indigenous Technology (Aalborg University Press).
50. MÜLLER, J. (1986). Teknologi en nøgle uden lås. Udvikling no. 5, pp. 3-6.
51. MØLLER, Flemming (1984). Social Cost-Benefit Analyse - Teori og Praksis. Dissertation (Ph.D.) (The University of Copenhagen).
52. MØLLER, Ole (1987). Access Planning - An analysis of planning procedures and appraisal methods for access improvement projects in rural areas of developing countries. Ph.D. thesis (The Technical University of Denmark).
53. NORAD (1981). Håndbok for evalueringsspørgsmål (Oslo).
54. OECD (1978). A Management Approach to Project Appraisal and Evaluation (Paris).
55. PEARCE, D.W. & NASH, C.A. (1981). The Social Appraisal of Projects (Macmillan Press, London).
56. PEDERSEN, Vita S. (1983). Brandt-Rapporten-Overlevelsesplan? For Hvem? (Roskilde University).
57. PROCEDURES FOR THE DESIGN AND EVALUATION OF ILO PROJECTS (1981-82). ILO, Bureau of Programming and Management.
58. PROJECT GUIDELINES - Appraisal - Planning, Danida, Copenhagen (1985).
59. RAVN, Hans F. & VIDAL, R.V.V. (1986). Operational research for developing countries - a case of transfer of technology, J.Opr. Res. Soc., vol. 37, no. 2, pp. 205-210.
60. ROEMER, M. & STERN, J.J. (1981). Cases in Economic Development: Projects, Policies and Strategies (Butterworths, London).
61. RONDINELLI, D.A. (1977). Planning Development Projects (Dowden, Hutchinson & Ross, Pensylvania).
62. SCHAUMBURG-MÜLLER, H. (1980). Den samfundsøkonomiske Projektvurdering. Den Ny Verden 3/4, pp. 307-333.

63. SCOTT, M.FG. et al. (1976). Project Appraisal in Practice (Heinemann, London).
64. SQUIRE, L. & van der Tak, H.G. (1975). Economic Analysis of Projects (The World Bank, Washington).
65. STEWART, F. & STREETEN, P. (1972). Little-Mirrlees Methods and Project Appraisal. Oxford Bulletin vol. 34, no. 1, pp. 75-92.
66. STEWART, Frances (1978). Social Cost-Benefit Analysis in Practice, World Development vol. 6, no. 2, pp. 153-165.
67. STEWART, F. (1977). Technology and Underdevelopment (Macmillan Press, London).
68. UN ASIAN AND PACIFIC DEVELOPMENT CENTRE (1983). Environmental Assessment of Devlopment Projects (Kuala Lumpur).
69. UNITAR (1980). Planning in Developing Countries, Theory and Methodology (Moscow).
70. VAN DEN TOORN, W.H. (1984). Decision Methodology: Utility-Based Trade-off Analysis, Working paper no. 15 (Twente University of Technology).
71. VIDAL, R.V.V. (1973). The Role of Operations Research in Underdeveloped Countries - an appraisal (IMSOR, Copenhagen).
72. WATSON, S.R. (1980. Decision Analysis as a Replacement for Cost/Benefit Analysis. EJOR no. 7, pp. 242-248.
73. WEISS, Dieter (1978). A critical comparison of a new World Bank Methodology with the UNIDO and the revised OECD approach. I. Socio-Econ. Plan. Sci. vol. 12, pp. 347-363.
74. ZAMBIA: Issues and options in the energy sector (1985). UNDP/World Bank ESMAP no. 039.

APPENDIX A

Example of guidelines for economic analysis based on extended Cost-Benefit Analysis

INTER-AMERICAN
DEVELOPMENT
BANK

Project
Analysis
Department

Guide for the Preparation of Loan Applications

BIO-ENERGY

GUIDELINES FOR THE PREPARATION OF LOAN APPLICATIONS	**Sector:** Sector: Non-Conventional Energy BIO-ENERGY	CHAPTER 7
	Asunto: Subject: Economic Evaluation	

Objective

The purpose of this chapter is to provide data showing the economic and social benefits it is hoped to obtain through the project, evaluating those benefits in relation to the costs involved in its execution and comparing the project with existing alternatives.

The information used for economic evaluation should be presented in such a way that the results obtained may be reconstructed without consulting other sources.

Methodology

Basic Summary

The economic evaluation of the project should begin with a detailed analysis of the demand for energy described in Chapter 2; depending on the nature of the project, the scope of this analysis should cover the demand for energy at the local,, regional or national levels. This analysis forms the basis for determining the need for the project (taking into consideration existing facilities and those already under construction), and for the quantification of direct project benefits.

The economic justification of a bio-energy project should demonstrate that the project is the least-cost solution for meeting energy demand requirements; in cases where the project forms only part of a larger program to meet identified demand requirements, the optimality of the entire program should be demonstrated.

In addition to the least-cost analysis described above, a complementary cost-benefit analysis should be performed for the project, comparing the anticipated economic benefits of the project with the economic costs of the project.

A separate economic evaluation should be prepared for each project component which is

Sector: Sector: BIO-ENERGY	Asunto: Subject: Economic Evaluation	CHAPTER 7

Methodology (Cont.)

technically and economically independent of other project components. On the other hand, where the project represents only part of an indivisible larger program (e.g. multi-purpose projects), the economic analysis should cover the program as a whole.

Economic Costs of Projects

The economic evaluation should be based upon the real social cost of resources used in implementing and operating the project. This means that resources should be valued on the basis of the possible alternative use of those resources by society (opportunity cost), and that expenditures which merely represent transfers from one sector of society to another --rather than actual depletion of resources-- should not be included in economic cost calculations.

Specifically, economic costs should not include taxes, import duties or financial charges, since these represent transfers between sectors rather than an actual use of resources. Price contingencies (cost escalation) should also be excluded, as the economic analysis is based only on real (not nominal) values of resources used or gained; only changes in the relative prices of resources should be taken into account, if they can be predicted with a reasonable degree of accuracy. On the other hand, when projects have significant external effects (e.g. displacement of local population, environmental consequences), the social cost of those effects should be included in the etermination of project costs. In the case of bio-energy projects, the opportunity cost of biomass used as an input (or the opportunity cost of resources used to produce that biomass) merits particular attention.

Sector : Sector: BIO-ENERGY	Asunto: Subject: Economic Evaluation	CHAPTER 7

Methodology (Cont.)

Shadow Prices

Where factors exist which distort the relationship between market prices and the true social value of resources, shadow prices rather than domestic market prices should be employed. Such distortions are frequently found in the value of unskilled labor, foreign exchange, and certain traded goods. In the case of goods which are marketed internationally (such as fuel), world market prices rather than domestic prices should be used (f.o.b. prices for exported goods, c.i.f. prices for imported goods). For unskilled labor, the real opportunity cost of that labor should be used rather than official wage rates. And, where information exists which allows a reliable estimate to be made of the shadow price of foreign exchange, that rate should be used rather than official exchange rated (it should be noted, however, that the shadow exchange rate does not necessarily bear any relationship to prevailing "black" of "parallel" market rates). Shadow prices should be applied in the calculation of economic benefits as well as costs of the project.

Least-Cost Analysis

This part of the evaluation should demondemonstrate that the project meets the projected demand for energy at the lowest possible economic cost, when compared with other possible alternatives. In making this comparison, differences in external costs (e.g. environmental costs) as well as operation and maintenance costs, should also be included. The total cost of each alternative should be expressed in present value terms, discounted at 12% p.a. Allowance should also be made for any discrepancy between anticipated economic benefits under the different alternatives evaluated.

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Least-Cost Analysis (Cont.)

Electricity Generation Projects

In the case of electricity generation projects which are connected to national or regional electric systems, the least-cost analysis should extend beyond the project itself, and ecompass all other projects in the long term expansion plan. The objective is to demonstrate that the project proposed for financing by the Bank, forms part of the optimal expansion plan for the system as a whole. Cost calculations for the comparison of alternative expansion plans should include investment, operation and maintenance costs of related transmission works, differences in transmission and distribution losses, and external costs (e.g. population resettlement) as well as the investment, operating and maintenance costs of the generating plants themselves. The analysis must also take into account the interaction between the operation of existing plants in the system, and new plants considered in different expansion plan alternatives.

Cost-Benefit Analysis

As implied, this part of the evaluation analyses both the expected economic benefits and the economic costs of the project. By comparing the costs of the project with the benefits, the relative importance of the project, compared with other investment alternatives in the country, can be established. The specific objective is to demonstrate that the economic return to investments made in the project is at least as high as the opportunity cost of capital in the country[1].

1 In the absence of more detailed information, the Bank broadly assumes that the overall return to capital in alternative investments in borrowing countries is 12% p.a.

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Cost-Benefit Analysis (Cont.)

Economic Benefits

The economic benefits of bio-energy projects should be calculated by contrasting the "with" and "without project" scenarios. The objective of bio-energy projects is normally: (i) to substitute bio-energy for alternative forms of energy currently consumed (e.g. fuels), (ii) to meet new energy demand requirements, or (iii) a combination of the above. Benefits, consequently, may be expressed in terms of (a) resource savings from the substitution of alternative sources of energy, and (b) the value assigned by consumers to additional availability of energy.

In the case of the substitution for alternative sources of energy, benefit calculations should be based on the real social value of resources saved as a result of the project. For example, where a bio-energy project substitutes for existing diesel thermoelectric generation, the economic value of such savings would be based on the international price of diesel oil (f.o.b. or c.i.f. depending on whether the country is a net exporter or importer of diesel oil), transport costs to the diesel generation plant, and transformation costs. Where the substitution of non-traded forms of energy is involved (e.g. firewood), economic benefits should be measured in terms of the opportunity cost of those resources.

In the cases where the bio-energy project is aimed at satisfying new or additional demand for energy (rather the substitution of existing sources of energy) benefits should be measured in terms of how much consumers would be willing to pay for that energy, rather than forego the use of the additional energy provided by the project. This "willingness to pay" can be estimated on the

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Cost-Benefit Analysis (Cont.)

basis of demand curves for different categories of consumers, and can be broken down into two components: (a) the amount they actually do have to pay for the energy consumed (e.g. electricity consumption times the average tariff per kwh), and (b) the value of the consumers' surplus. In the determination of demand curves, distinction should be made between residential, commercial, industrial and other consumers, as well as between existing consumers and new consumers within each group.

To the extent possible, external benefits should also be quantified and included in the analysis. In the case of bio-energy projects, external benefits could include benefits to the agricultural sector (e.g. improved forestry practices, production of organic fertilizers and other useful by-products, etc.), the public health sector (e.g. disposal of urban waste), as well as environmental benefits (e.g. erosion control).

Results

The results of the cost-benefit analysis should be presented in terms of an internal rate of return calculation, as well as a net present value calculation (using a 12% discount factor). These calculations should be made for each part of the project which constitutes an independent and separable unit (e.g. bio-energy sub-projects serving different geographical areas). On the other hand, where the project represents only part of an indivisible larger program (e.g. a multi-purpose project), the analysis should cover the overall program.

Sensitivity Analysis

Sensitivity analysis should be performed for possible variations in the princial variables used in the basic economic evaluation (including project costs, benefits, demand

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Sensitivity Analysis (Cont.)

demand requirements, fuel prices, etc). For each variation, the impact on rate of return and net present value calculations should be indicated, as well as any impact on the least-cost analysis.

Optimal Timing

The optimal timing of initiating the project should be verified, comparing the incremental costs and benefits of different start-up dates. This analysis should demonstrate that the value of foregone benefits would exceed the value of cost savings if the project were postponed by one or more years, and that the increase in project costs would exceed the value of additional benefits if the project were undertaken one or more years earlier.

Optimal Design

An analysis of the scale of the project should be performed, demonstrating that the dimensions selected are optimal.

Distribution of Benefits

An analysis of the distribution of the project benefits should be made, focussing on the proportion of direct private sector benefits accruing to low income groups. In general, direct benefits to low income groups include transfers to unskilled workers during construction and operation of the project (i.e. the difference between actual wage costs and the opportunity cost of unskilled labor), low income beneficiaries' share of the "consumers' surplus" for new or additional energy consumption, and (when applicable) savings from substitution of alternative forms of energy previously consumed by low-income households. The analysis of low-income beneficiaries, which may involve a household survey, should include information concerning the occupation, education, health, housing conditions and estimated per capita income levels of low-income families.

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Tariff Structure

Where applicable, an analysis of the rele-relevant rate structure for energy (e.g. electricity tariffs, fuel price controls) should be included. The objective of this analysis should be to determine whether existing rate structures promote the efficient use of energy, considering the marginal costs of providing service and an equitable distribution of those costs between users. In the case of electricity generation projects, factors to consider include adequate expansion of the electric system, seasonal and hourly variations in generation costs, and rates paid by low--income consumers.

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PROJECT PLANNING AND ANALYSIS

– Methods for assessment of rural energy projects in developing countries

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Abstract (Max. 2000 char.)

The report presents the results of both a theoretical and an empirical study of the role of project analysis in the national planning efforts of developing countries.
The most commonly used methods for especially the economic analysis – the socalled "cost-benefit methods" – are described in detail and the historical development of these methods is related to the dominant development theories. The theoretical and ideological basis, the methodological principles and the practical use of the methods are critically discussed.
The empirical study is based on a close collaboration with the Department of Energy (DOE) in Zambia, and focus has been on the activities aiming at energy and development in rural and suburban areas.
Based on an evaluation of the specific planning situation in the DOE a new approach to project analysis aiming at the activities related to energy and rural development has been developed. The approach has been implemented on a personal computer and a user oriented presentation of the simple and modular model (PRAM) is included.
The new approach reflects the criticism of the existing methods and emphasizes the importance of a combination of qualitative and quantitative considerations in the analysis and the use of a broad set of criteria.

Descriptors – EDB

COST BENEFIT ANALYSIS; DEVELOPING COUNTRIES; ENERGY MANAGEMENT; ENERGY MODELS; ENERGY SUPPLIES; RURAL AREAS; SOCIO-ECONOMIC FACTORS; TECHNOLOGY ASSESSMENT

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